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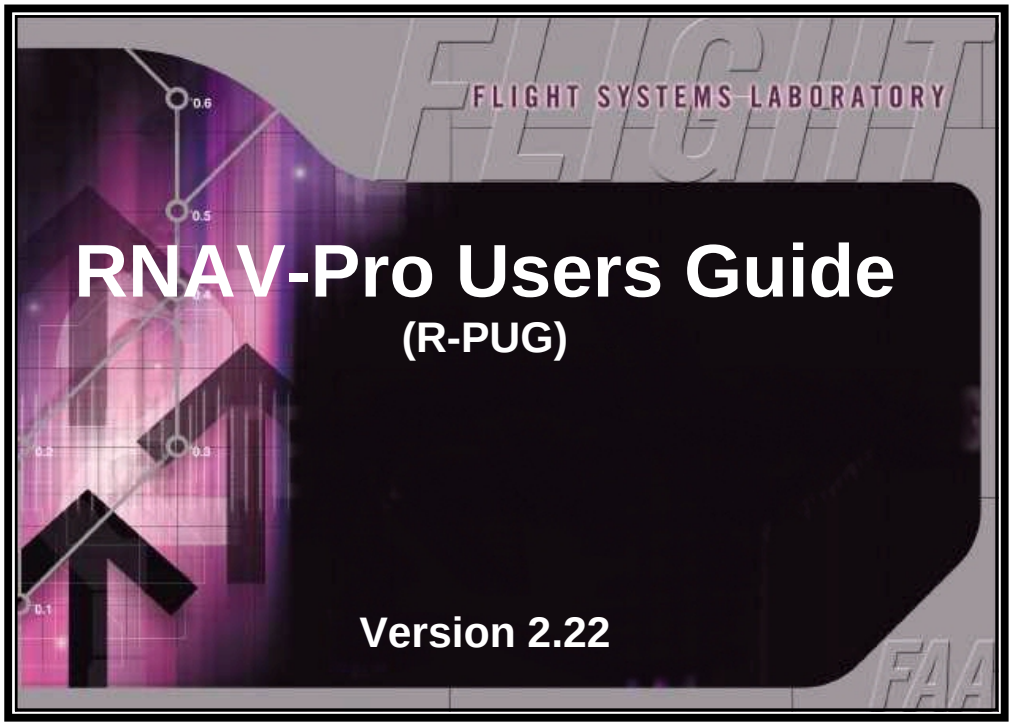

Flight Systems Laboratory

Flight Operations Simulation and Analysis Branch, AFS-440
Flight Technologies and Procedures Division
Federal Aviation Administration

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RNAV-Pro Users Guide

Air Traffic Simulation, Inc.

HELP LINE: (405) 620-0809

Foreword

RNAV-Pro is a computer program that provides procedure developers with a screening model to aid in the development of RNAV routes. This screening model is not intended to serve as the final authority in RNAV route procedure design. RNAV-Pro should NOT be used as a substitute for other procedures, such as flight inspection, which are required in the RNAV route implementation process.

RNAV-Pro is a continually evolving product. Software and user interface enhancements are frequently made to increase RNAV-Pro's utility. Consequently, display examples in this Users Guide may vary slightly from actual displays observed while accessing RNAV-Pro via the Internet.

Neither the Federal Aviation Administration (FAA) nor any other parties involved in the creation or distribution of this program take any responsibility for the correctness of the data entered into this model or for the applicability of this model to any specific case. It is the responsibility of the user to verify all data used by this model.

RNAV-Pro software and databases have been developed for use within the United States National Airspace System (NAS). Individuals requiring application software of a screening model outside of the NAS should contact **Support@atsi.aero**.

Table of Contents

1.0 Introduction

This **RNAV-Pro Users Guide (R-PUG)** is intended to assist users in the development and implementation of RNAV routes through the use of RNAV-Pro. RNAV-Pro has been developed by the FAA's Flight Operations Simulation and Analysis Branch, AFS-440, at the Mike Monroney Aeronautical Center in Oklahoma City, Oklahoma. RNAV-Pro is the FAA's approved automation tool to evaluate key Area Navigation (RNAV) and Required Navigation Performance (RNP) route elements. These elements include Terminal Instrument Procedures (TERPS) Criteria Screening, Flyability Screening, DME/DME Screening, Radar Coverage Screening, Communication Coverage Screening, and Engine Out evaluation.

RNAV-Pro is a secured, Internet-based application located at:

RNAVPRO.faa.gov

To obtain a user name and password, please contact:

Flight Operations Simulation and Analysis Branch, AFS-440

E-mail: Support@rnavpro.com

1.1 Locating RNAV-Pro

RNAV-Pro is located on the Internet at: **RNAVPro.faa.gov**

The following **RNAV-Pro Login Window** appears when RNAV-Pro is accessed.

Below the Login Window the user may link to the Air Traffic Simulation, Inc. web site to access the RNAV-Pro internet briefing or for questions activate or e-mail questions to RNAV-Pro Support.

Figure 1-1: RNAV-Pro Login Window

1.2 Logging In to RNAV-Pro

Enter username and password and press **"Log In"** at the **RNAV-Pro Login Window** to log in to RNAV-Pro.

Note:	To obtain a username and password, please contact the RNAV-Pro Help Desk: E-mail: support@rnavpro.com

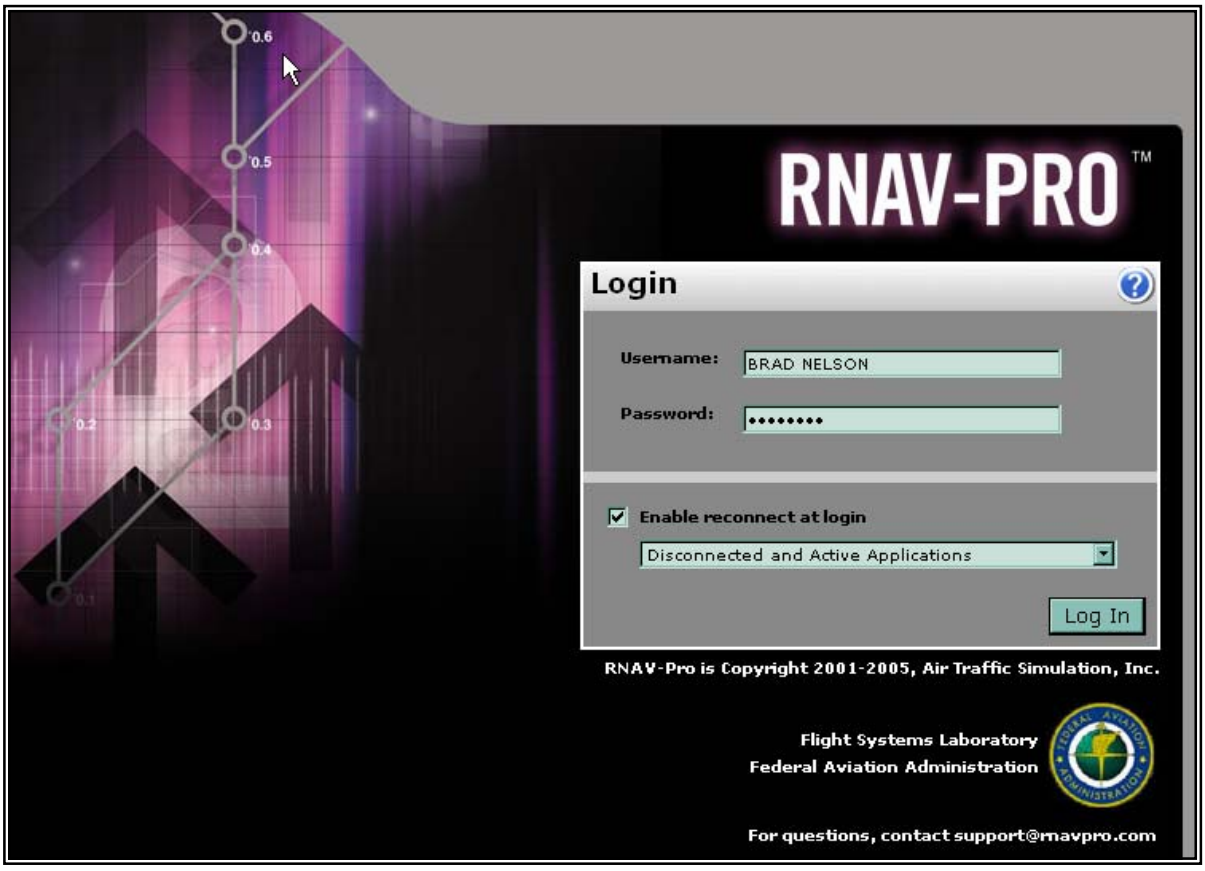


Figure 1-2: Entering Username and Password

Note:	The first time RNAV-Pro is run on a computer, the user is requested to download a Citrix ICA 32-bit Windows Web Client. Please refer to Section 1.3.

Once the **RNAV-Pro Login Window** appears, select the **RNAV-Pro 2.22** icon.

Figure 1-3: Accessing RNAV-Pro

The **ICA Client File Security Window** appears in front of the RNAV-Pro Main Display Window following the RNAV-Pro Applications Window and asks the user to choose from the following options:

Note:	Refer to Section 2.0 for details on the RNAV-Pro Main Display Window.

- **No Access:** Allows no read or write access to the user's computer.
- **Read Access:** Allows only read access to the user's computer. Flight plan information can be read from the user's computer, but writing of resultant Results information is prohibited.
- **Full Access:** Flight plan information can be read from and resultant Results information written to the user's computer.

Select desired access and click **"OK."**

Note:	If you plan to store RNAV-Pro Results files on your computer's hard drive, you must select **"Full Access."**

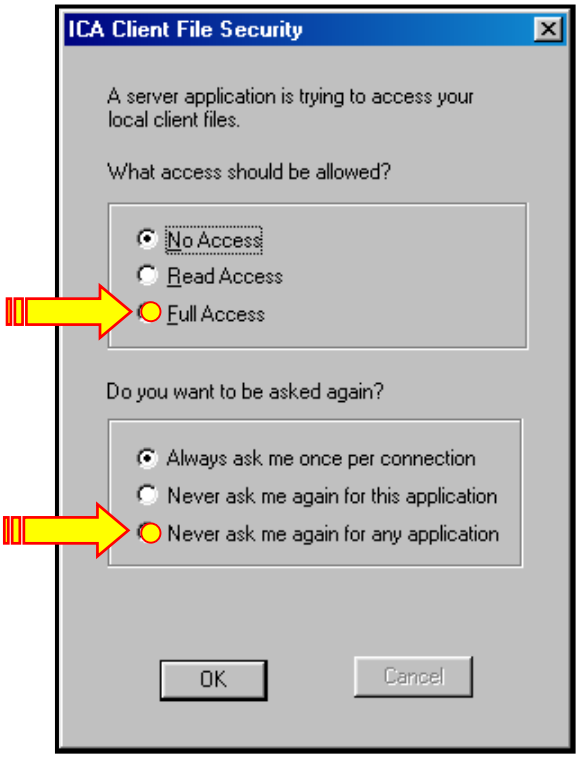


Figure 1-4: ICA Client File Security Window

1.3 Downloading the Web Client

If you have Citrix problems when launching RNAV-Pro, please perform the following steps.

Figure 1-5: Downloading the Web Client

STEP 1 - In the Control Panel:

- Go to **Add or Remove Programs**.
- Remove any programs that begin with the word "Citrix" or "MetaFrame".
- Restart your computer.

STEP 2 - On the Internet:

- Go to www.citrix.com .
- Under "**Top Downloads"** click **"1.Citrix Presentation Server Client Packager – Version 9.0"** (on the right side of the display).
- Scroll to the bottom of the display to the drop-down menu under **"More Download Versions."**
- Select **"Web Version 9.0"** the drop-down menu.
- Under **"Available Versions"**, find the **Version 9.0 (English) .exe 2.7 MB** file and press **"Get Software."**
- On the pop-up menu that appears, click **"Download Here."**
- In the **File Download Security Warning** pop-up that appears**, press "Save"** and save the ica32t.exe application in the **C folder** on the computer's hard drive.

- **Step 3 - After Exiting the Internet**:

  1) Close all open programs and bring up Windows Explorer.
  2) Find the ica32t.exe application in the **C folder** on your computer's hard drive and **double-click on the application**.
  3) Continue to install the application by following the **installation instructions.**
  4) When the installation is complete, restart your **web browser**.

RNAV-Pro should now be accessible via the Internet.

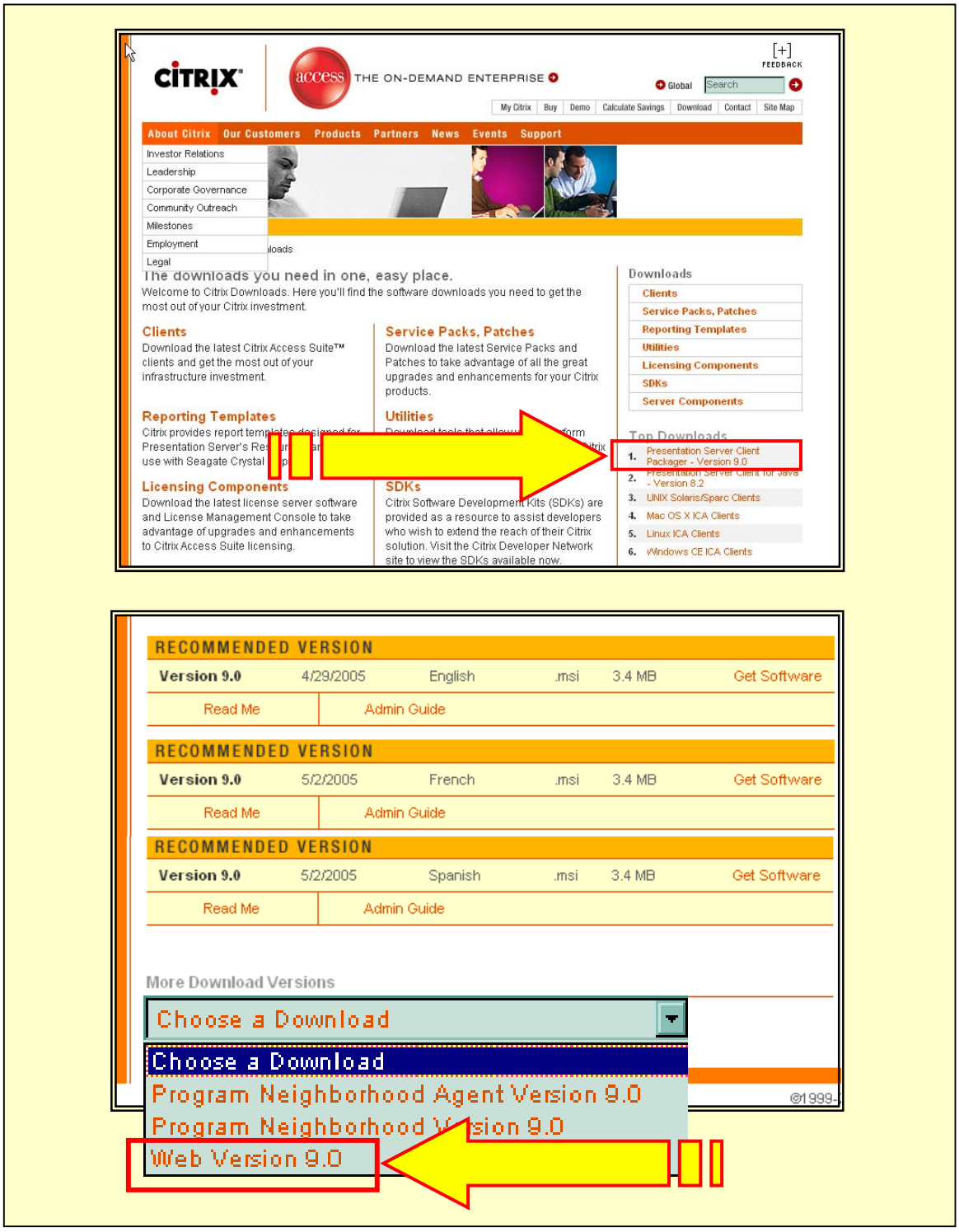


Figure 1-6: Downloading the Web Client, Step 2

1.4 Logging Out of RNAV-Pro

Complete the following procedure to **log out** of RNAV-Pro:

On the RNAV-Pro Main Display Window, select **"File."** On the File drop-down menu, select **"Exit."**

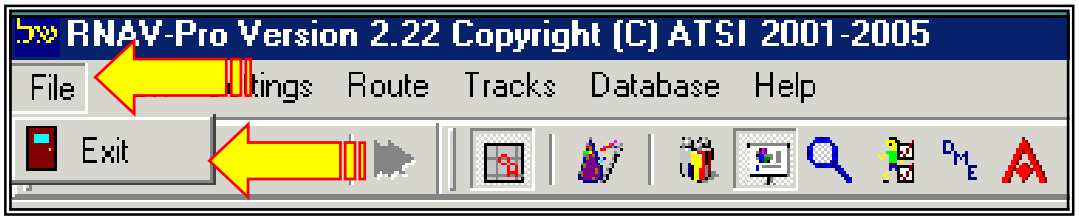


Figure 1-7: Logging Out of RNAV-Pro, Step 1

The **RNAV-Pro Logoff Window** appears. Select the **Log Off** button. The Login Window appears, allowing login by you or others at a later time.

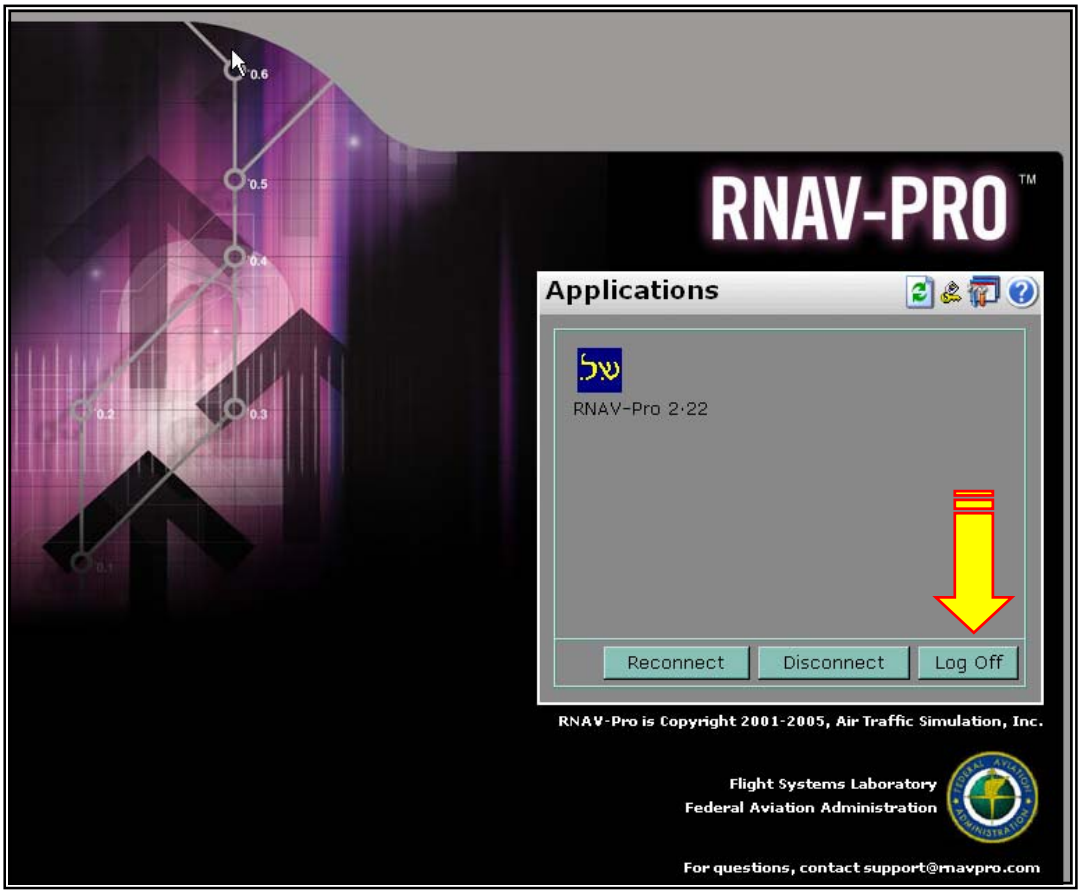
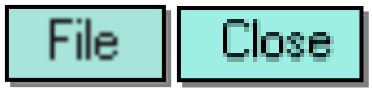


Figure 1-8: Logging Out of RNAV-Pro, Step 2



Once the RNAV-Pro Login Window appears, select **"File."** On the File drop-down menu, select **"Close"** to exit the Internet.

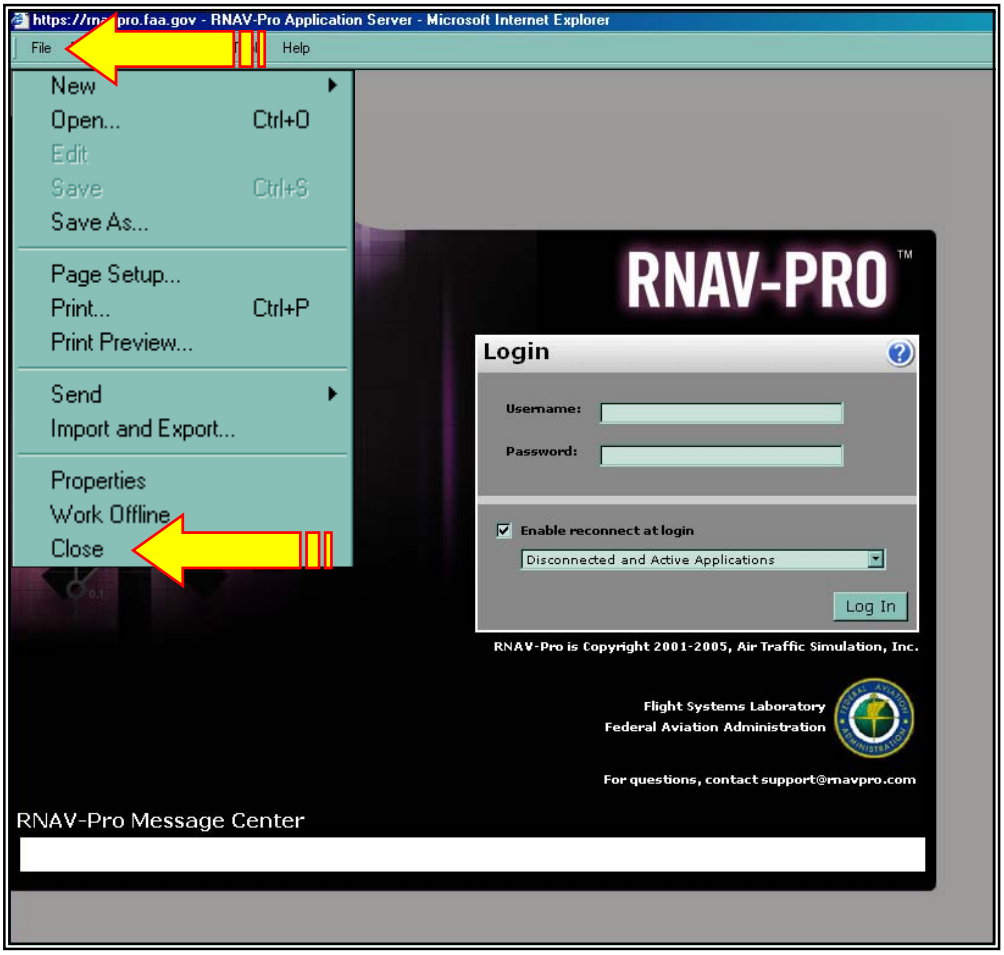


Figure 1-9: Logging Out of RNAV-Pro, Step 3

2.0 Main Display Window

The **RNAV-Pro Main Display Window** includes a toolbar, display information, a series of selectable drop-down menus, Windows-style buttons, radial buttons, square buttons, modules, and vertical tabs that provide a user-friendly interface with the program.

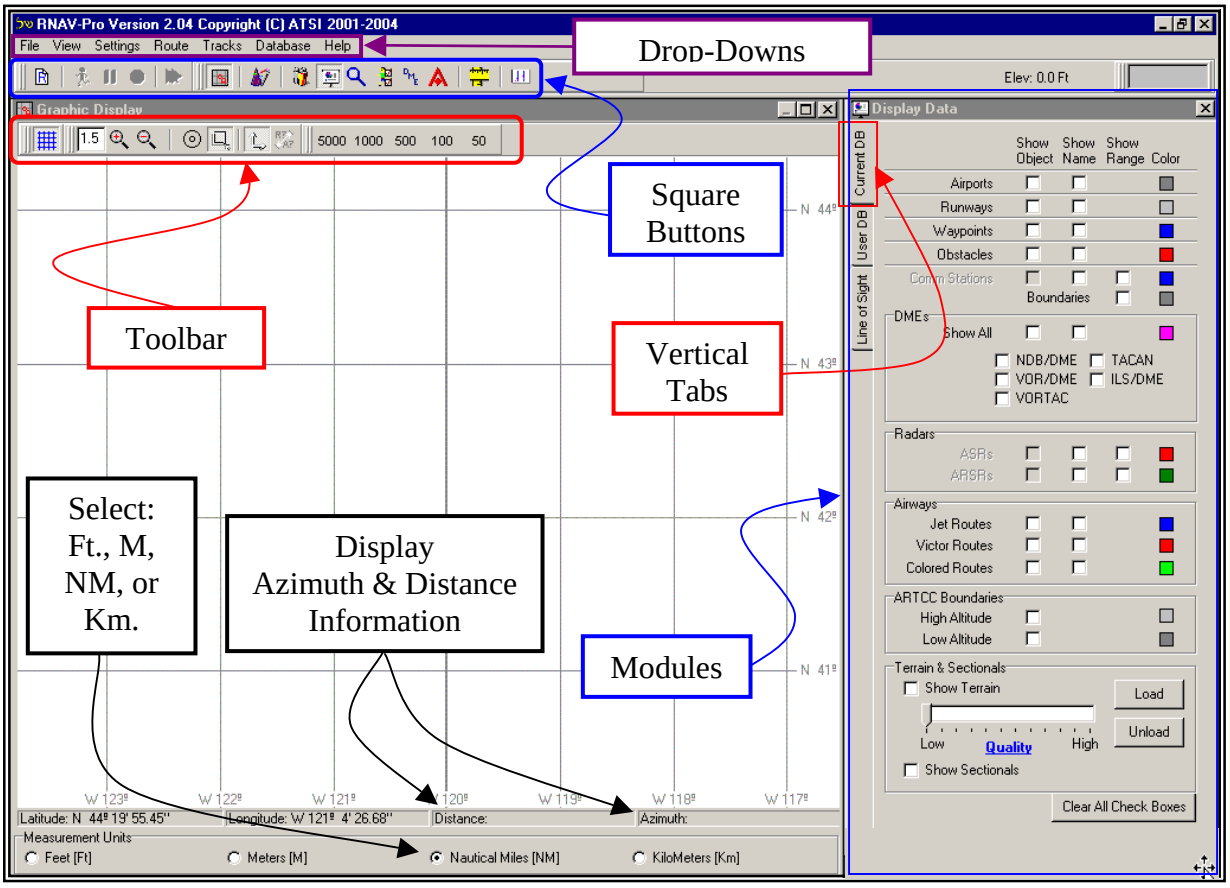


Figure 2-1: Main Display Window

2.1 Toolbar

The **toolbar** allows the user to: toggle grid visibility; adjust zoom magnification; zoom in and out; recenter the display; select a specific area to zoom; move the visible area; measure distance and azimuth; and zoom to 50, 100, 500, 1000, or 5000 nautical miles (NM). The toolbar includes the following:

- **Grid Visibility:** A toggle button that displays latitude/longitude grid when selected.
- **Zoom Magnitude:** Allows the user to input magnification values larger than 1.0. Used in conjunction with Zoom In and Zoom Out.
- **Zoom In:** Allows the user to zooms in by a value entered in Zoom Magnitude.
- **Zoom Out:** Allows the user to zooms out by a value entered in Zoom Magnitude.
- **Recenter:** A toggle button that when selected, recenters the display via a left click of the mouse.
- **Area to Zoom:** A toggle button that when selected, zooms in to an area selected via a left click, hold, and drag of the mouse.

Note:	If either **Recenter** or **Area to Zoom** is selected, the other button cannot be used. If one of these buttons is already selected, selecting the alternate button will toggle off the previously selected button. Pressing the Alt key in conjunction with a left click will perform the function associated with the non-selected button.

- **Move the Visible Area:** A toggle button that when selected, moves the display the distance and direction specified via a right click and drag of the mouse.
- **Distance and Azimuth:** A toggle button that when selected, measures the distance and azimuth specified via a right click and drag of the mouse.

Note:	If either **Move the Visible Area** or **Right Click and Drag Distance and Azimuth** is selected, the other button cannot be used. If one of these buttons is already selected, selecting the alternate button will toggle off the previously selected button. Pressing the Alt key in conjunction with a right click will perform the function associated with the non-selected button.

Note: The unit of distance measurement (feet, meters, nautical miles, or kilometers) for distance and azimuth is selected via the Measurement Units radial buttons at the bottom of the Graphic Display. See Section 2-27

- **Zoom to x Nautical Miles:** Zooms to display the selected distance of 5000, 1000, 500, 100, or 50 nautical miles.

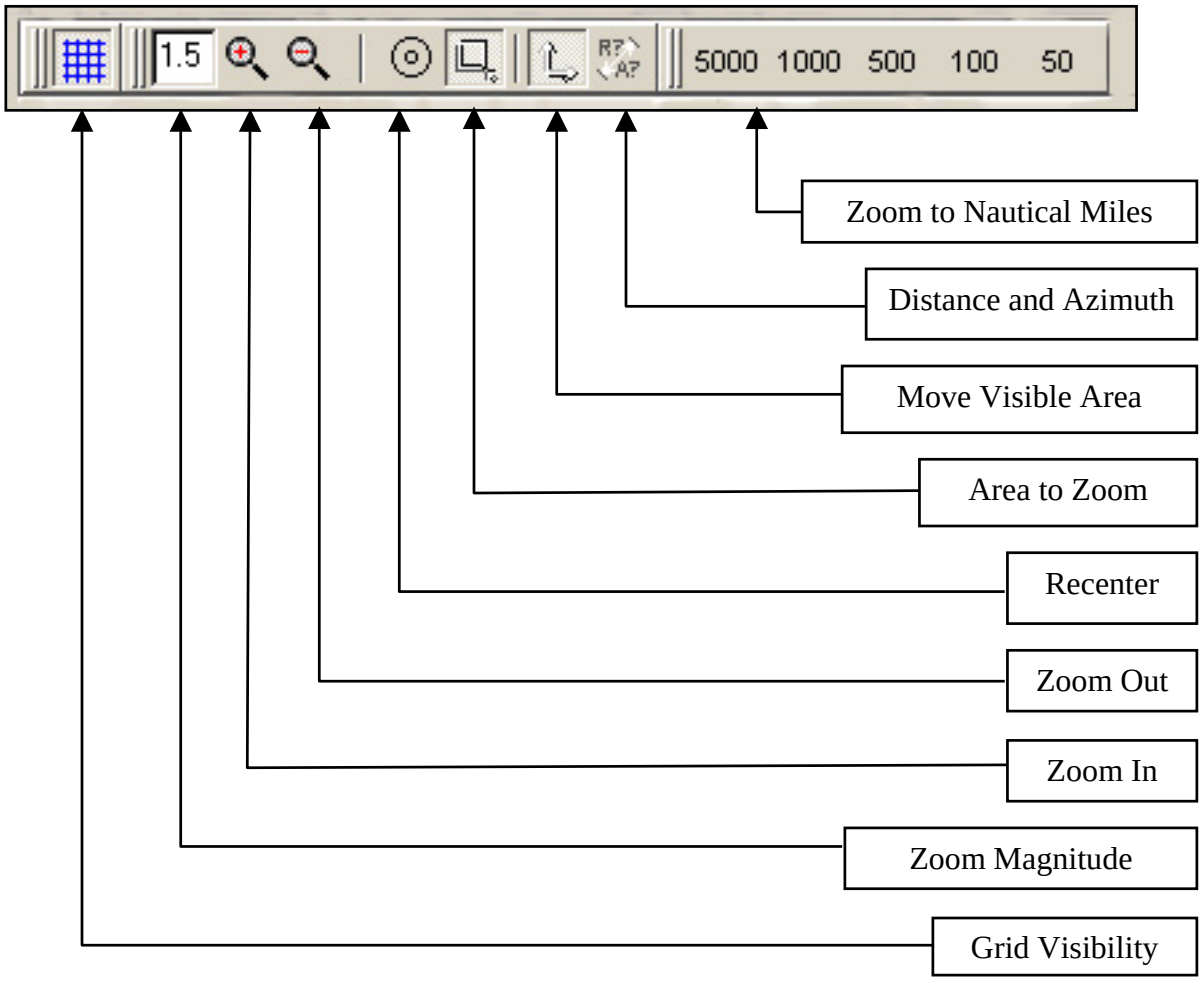


Figure 2-2: Toolbar

2.2 Radial Buttons

The Graphic Display has four **radial buttons.** Distance measurement units corresponding to the selected button will be displayed. When the Distance and Azimuth tool is used. Measurement unit options include:

- Feet
- Meters
- Nautical miles
- Kilometers

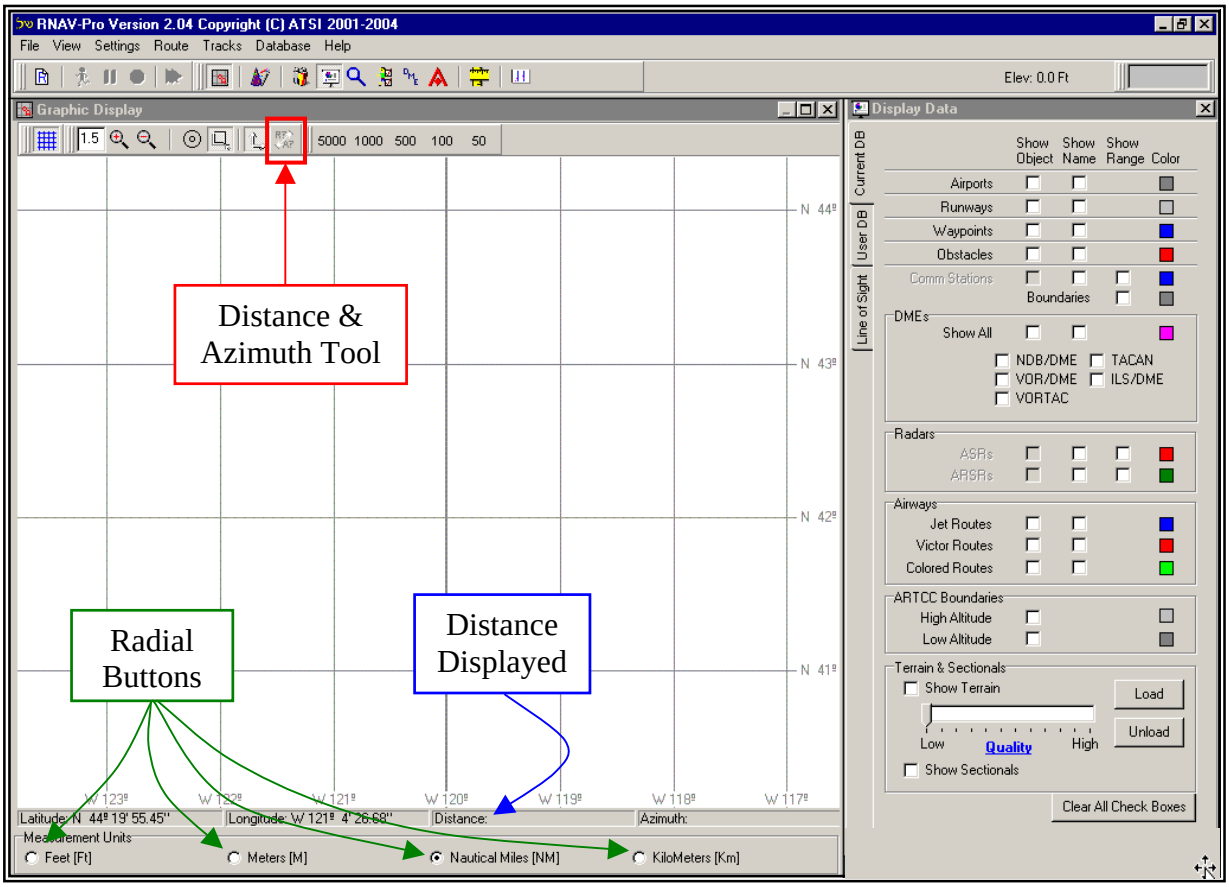


Figure 2-3: Radial Buttons

2.3 Square Buttons

The Main Display Window has 15 **square buttons** above the toolbar. These include:

- **New Route:** Displays the Open dialog box where saved flight plan tracks are stored.
- **Run Simulation:** Initiates a flight track on a previously loaded route.
- **Pause Simulation:** Pauses a flight track simulation.
- **Stop Simulation:** Stops a flight track simulation.
- **Erase Tracks and Run:** Erases the displayed flight track and reruns the loaded flight track.
- **Show Display Area:** Shows the Graphic Display.
- **Route Wizard:** Opens the Route Wizard to create a Flight Plan Data Input File (FPDIF). Data required in the FPDIF is WP Name, WP Type, Lat/Long, Altitude, IAS, Turn Type, Turn Direction, Leg Type, and CF Radial.
- **User Settings:** Opens the User Settings Module, which allows the user to enter a name and assign a name to his/her project.
- **Display Data:** Opens the Display Data Module, which allows the user to select items to be displayed from the database such as airports, runways, waypoints, database obstacles, DMEs, radars, communications, airways, ARTCC boundaries, DTED (Digital Terrain Elevation Data) and sectional charts.
- **Search Data:** Opens the Search Data Module, which is used to search for selected airports, runways, waypoints, DMEs, radars, and airways via **"Search Request."**
- **Simulations:** Opens the Simulation Module, which inputs simulation information prior to running Flyability, DME, Radar, or Communications Screenings.
- **DME Extra Options:** Opens the DME Extra Options Module to create and evaluate DME Grid areas and to view Service Volume Cross Sections.
- **TERPS:** Opens the TERPS Module to generate TERPS/engine out surfaces and evaluate surface penetrations.
- **User Data:** Opens the User Data Module, which is used to add, edit or delete a DME facility, radar site, radio communication station, or obstacle.
- **Results:** Provides results on Flyability, DME, Radar, Communications, TERPS Screening and Engine-Out assessment.

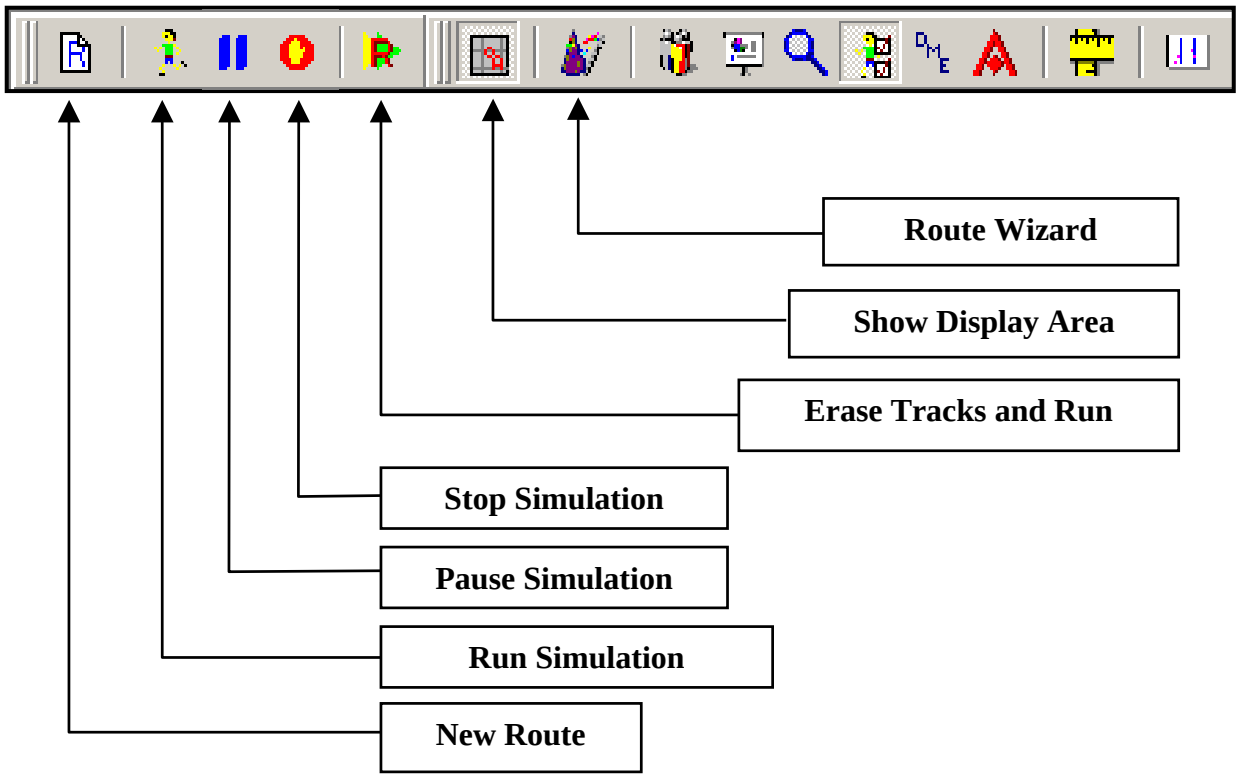


Figure 2-4: Square Buttons

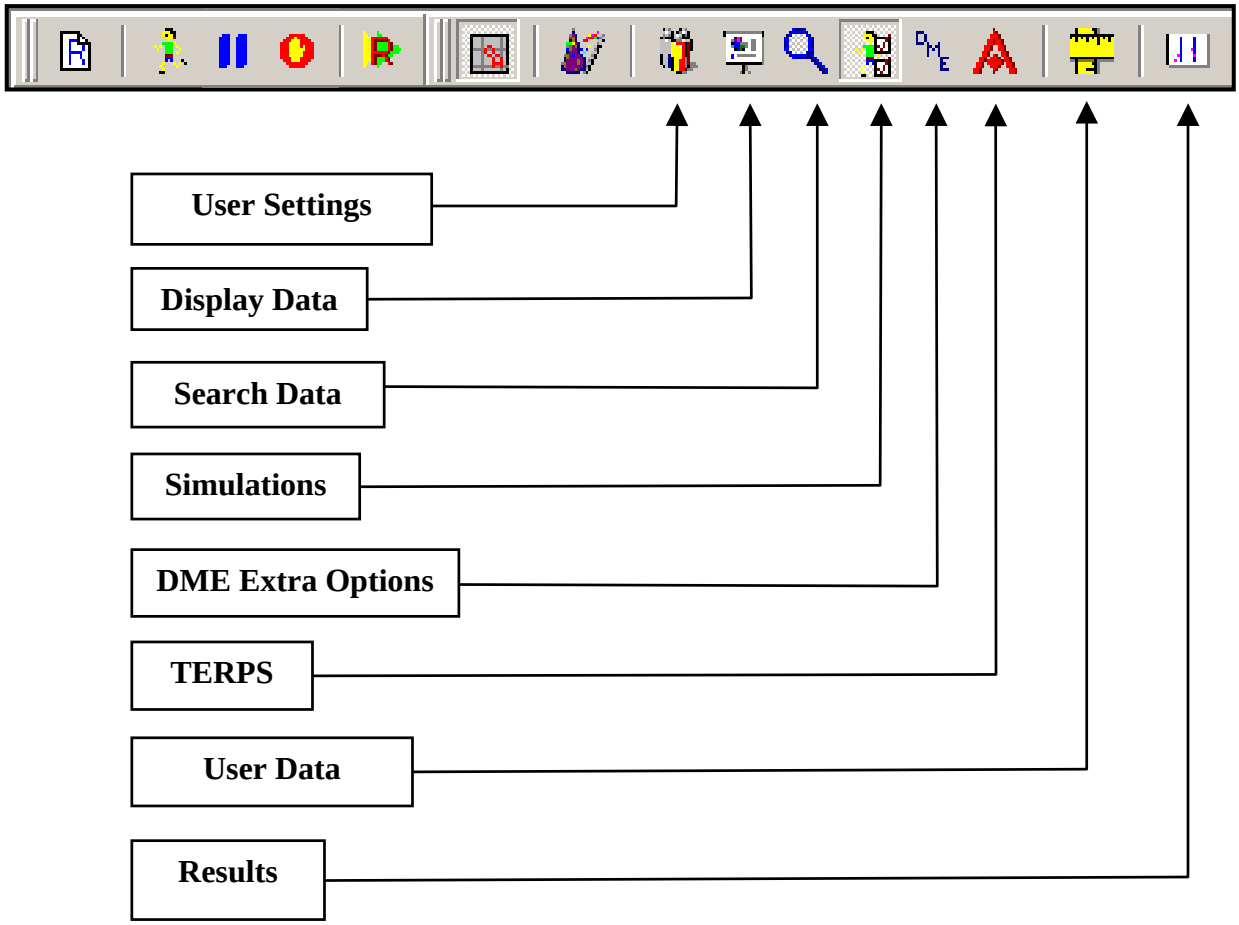


Figure 2-5: Square Buttons (cont'd)

2.4 Drop-Down Menus

The Main Display Window has the following seven **drop-down menus:**

2.4.1 File Drop-Down Menu

Used to exit RNAV-Pro, returning the user to the RNAV-Pro Applications Window.

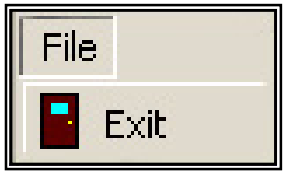


Figure 2-6: File Drop-Down Menu

2.4.2 View Drop-Down Menu

- **Graphic Display:** Shows the Graph Display Area.
- **Projection:** Allows the selection of either an Angle, Distance, or Map Projection.
- **User Settings:** Opens the User Settings Module, which allows the user to enter a name and assign a name to his/her project.
- **Display Data:** Opens the Display Data Module, which allows the user select items to be displayed from the database such as airports, runways, waypoints, database obstacles, DMEs, radars, communications, airways, ARTCC boundaries, DTED, and sectional charts.
- **Search Data:** Opens the Search Data Module, which is used to search for selected airports, runways, waypoints, DMEs, radars, and airways via **"Search Request."**
- **Simulations:** Opens the Simulation Module, which inputs simulation information prior to running Flyability, DME, Radar, or Communications Screenings.
- **DME Extra Options:** Opens the DME Extra Options Module to create and evaluate DME grid areas and to view service volume cross sections.
- **TERPS:** Opens the TERPS Module to generate TERPS/engine out surfaces and evaluate surface penetrations.

- **User Data:** Opens the User Data Module, which is used to add, edit, or delete a DME facility, radar site, radio communication station, or obstacle.

- **Results:** Provides results on Flyability Screening, DME Screening, Radar Screening, Communications Screening, and TERPS/Engine Out and DME Area Assessment.

- **Reset Window Position:** Repositions Graphic Display, modules, and top bar into proper alignment.

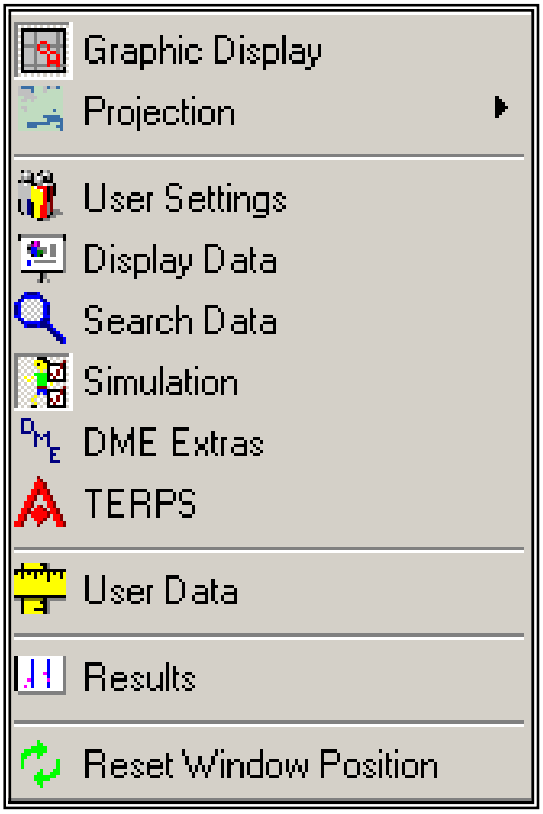


Figure 2-7: View Drop-Down Menu

2.4.3 Settings Drop-Down Menu

Allows the user to select the following options:

- **Reload:** Reloads database settings, flight plans, simulation settings, and user settings.
- **Load Settings:** Loads selected settings.
- **Save Settings:** Saves previously loaded settings.
- **Reset to Default:** Resets settings to default values.

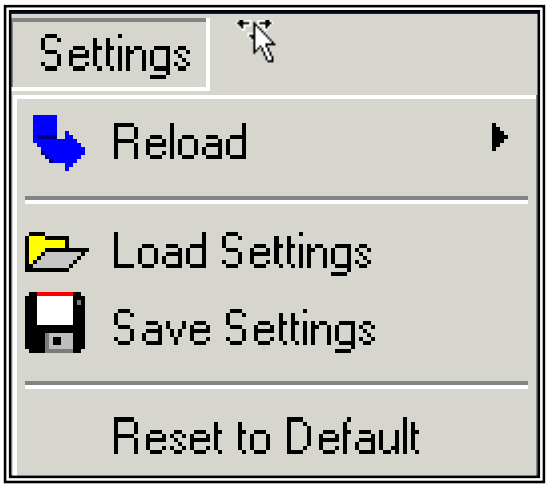


Figure 2-8: Settings Drop-Down Menu

2.4.4 Route Drop-Down Menu

Allows the user to select the following options:

- **Route Wizard:** Is a user-friendly method of creating a FPDIF.
- **Load Route:** Loads or activates a flight track.
- **Add Routes:** Allows user to load an additional flight plan.
- **Zoom Route:** Centers the loaded flight plan in the display area.
- **Edit Route:** Allows the user to edit the fields of an FPDIF.
- **Clear All:** Clears all data in the FPDIF.

Figure 2-9: Route Drop-Down Menu

2.4.5 Track Drop-Down Menu

- **Color:** Changes the color of a track.
- **Width:** Changes the width of a track.
- **Clear:** Clears a track that has been run.

Figure 2-10: Track Drop-Down Menu

2.4.6 Database Drop-Down Menu

Allows the user to select the **AVN** database.

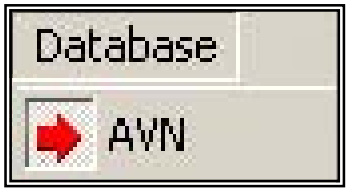


Figure 2-11: Database Drop-Down Menu

2.4.7 Help Drop-Down Menu

Allows the user to select the following options:

- **Release Notes:** Displays changes made to the current and prior versions of RNAV-Pro.
- **Interactive Lesson:** Allows the user to access the Interactive Training.
- **User Manual:** Allows the user to access the Users Guide.
- **Submit Report:** Allows the user to submit a report to the FAA's Flight Operations Simulation and Analysis Branch identifying a problem that the user has encountered or offering a suggestion that will increase the utility of RNAV-Pro.

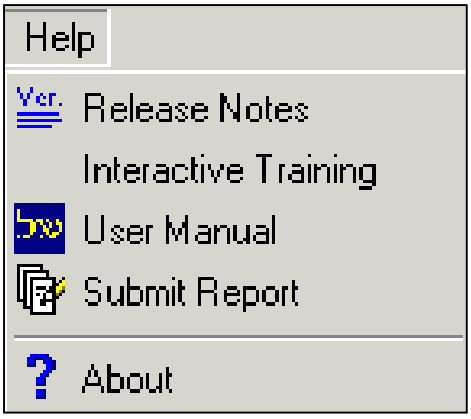


Figure 2-12: Help Drop-Down Menu

2.5 Main Display Information

The Main Display Window provides display information on:

- **Sim Time:** Displays the simulated flight time (in seconds) while a flight plan simulation is run via the Run button.
- **Elevation:** Displays the elevation of a location identified via the mouse, provided DTED has been loaded.
- **Latitude:** Displays the latitude of the location identified via the mouse.
- **Longitude:** Displays the longitude of the location identified via the mouse.
- **Distance:** Displays the distance (as selected with the Measurement Units radial buttons) between two points identified via a mouse click, hold, and drag provided the Distance and Azimuth toolbar button has been selected.
- **Azimuth:** Displays the azimuth (in degrees true) between two points identified via a mouse click, hold, and drag provided the Distance and Azimuth toolbar button has been selected.

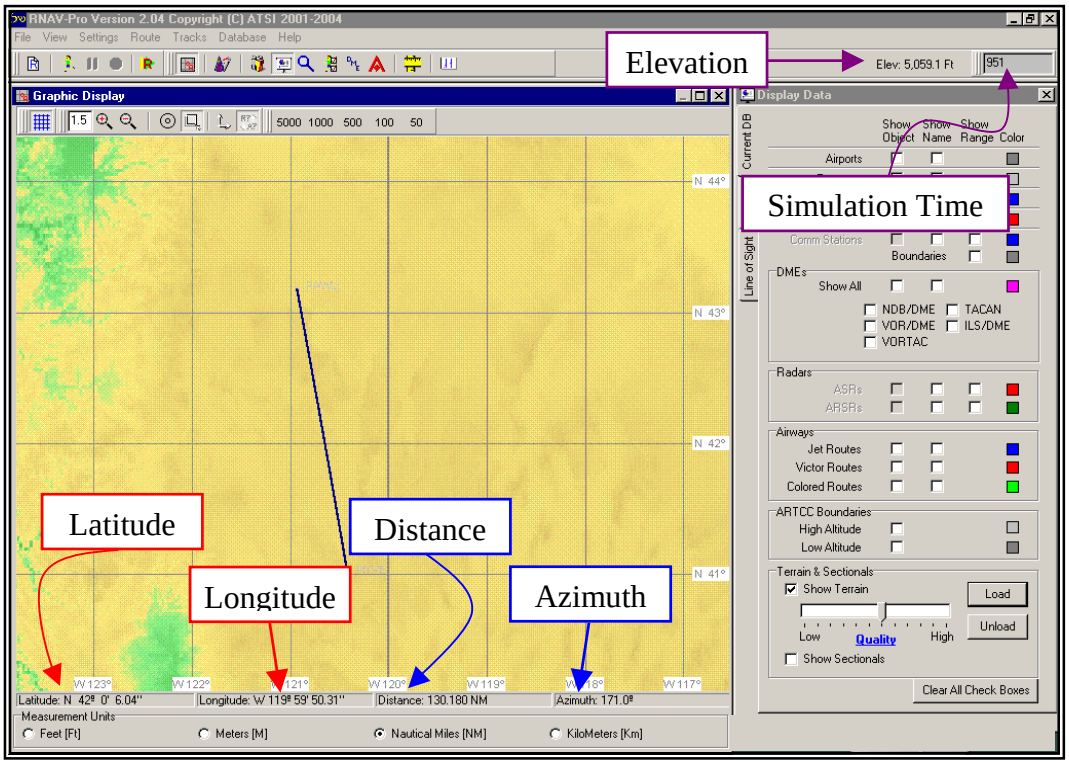


Figure 2-13: Main Display Information

2.6 Modules

Modules are located on the right side of the Main Display Window. There are seven modules: **User Settings, Display Data, Search Data, Simulations, DME Extras, TERPS,** and **User Data.** Square buttons or the View drop-down menu can open these modules.

Figure 2-14: Modules

2.6.1 User Settings Module

Allows the user to enter the following information:

- **User Name:** Initially displays the user login name. The user may modify this field.
- **Project Name:** Is supplied by user.

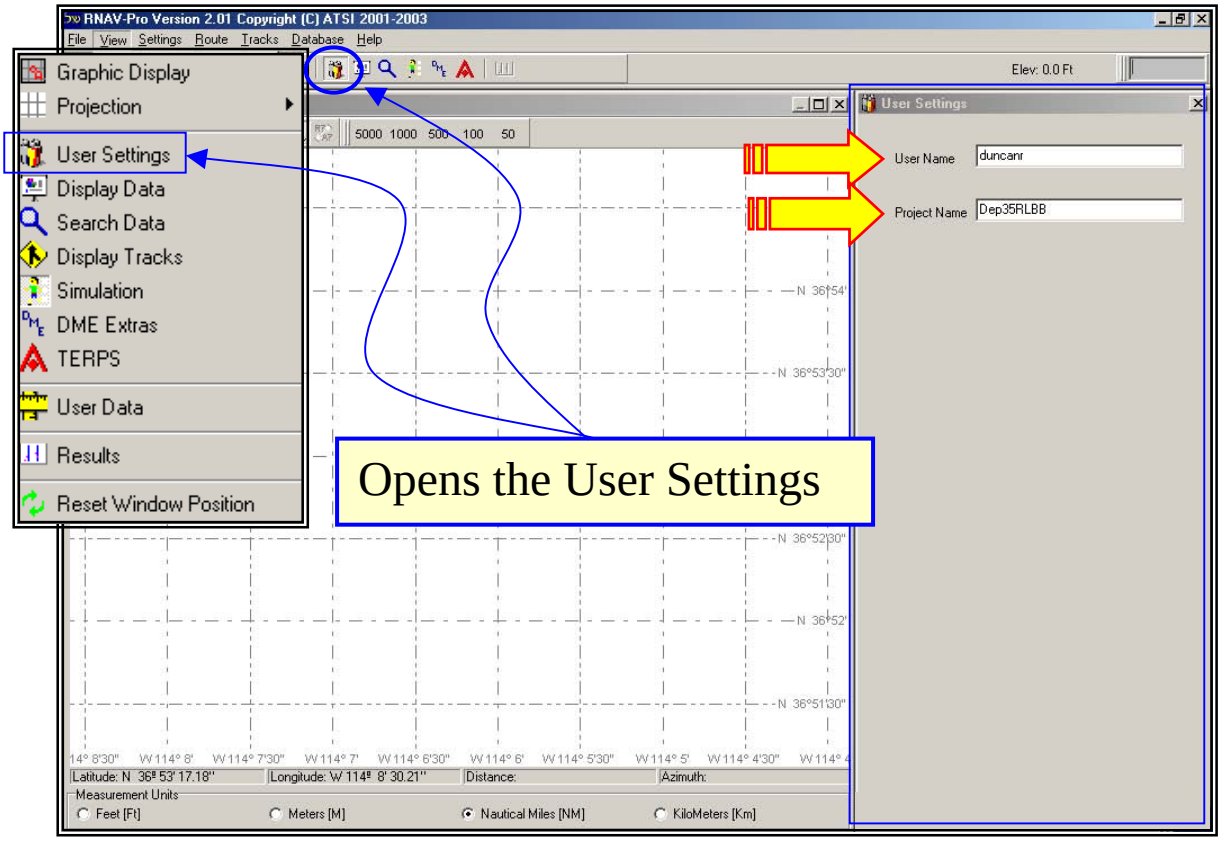


Figure 2-15: User Settings Module

2.6.2 Display Data Module

Allows the user to display selected database items and evaluate line of sight using the following three tabs:

- **Current Database Tab**
- **User Database Tab**
- **Line of Sight Tab**

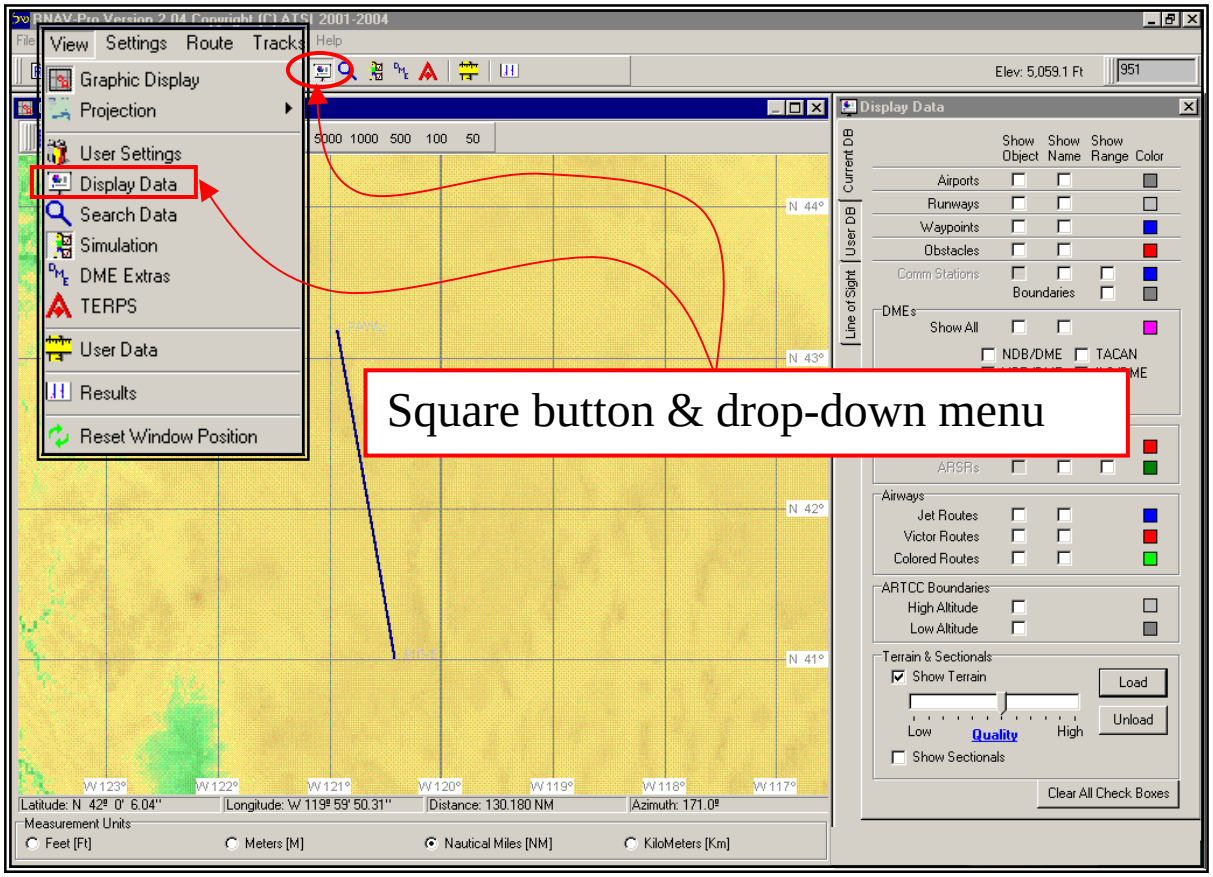


Figure 2-16: Display Data Module

2.6.2.1 Current Database Tab

This tab is used to display airports, runways, heliports, waypoints, obstacles, communications and their boundaries, DTED and sectional charts. The user may select the following checkboxes to display/select up to four options for each item.

- **Show Object:** Displays an item's location on the drawing area.
- **Show Name:** Displays the name of the item on the drawing area.
- **Show Range:** Shows the range coverage on the drawing area (if "Show Object" has also been selected).
- **Select Color:** Allows the selection of color.

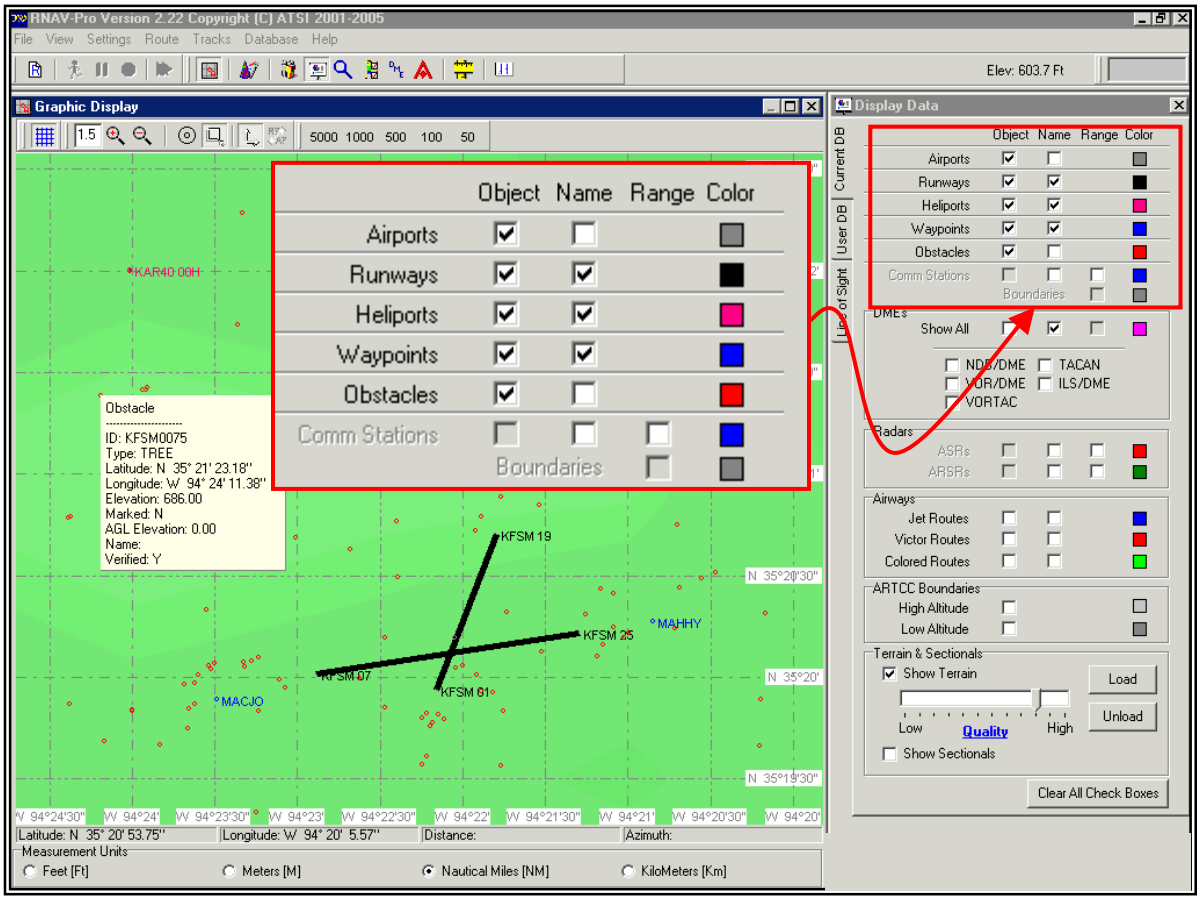


Figure 2-17: Airports, Runways, Heliports, Waypoints, Obstacles, Communication Stations, and Boundaries

This tab also allows user to select and display **DME** facilities in he area labeled DME.

- **Show All:** Shows name and color for the following if they are selected:
    - NDB/DME
    - VOR/DME
    - VORTAC
    - TACAN
    - ILS/DME

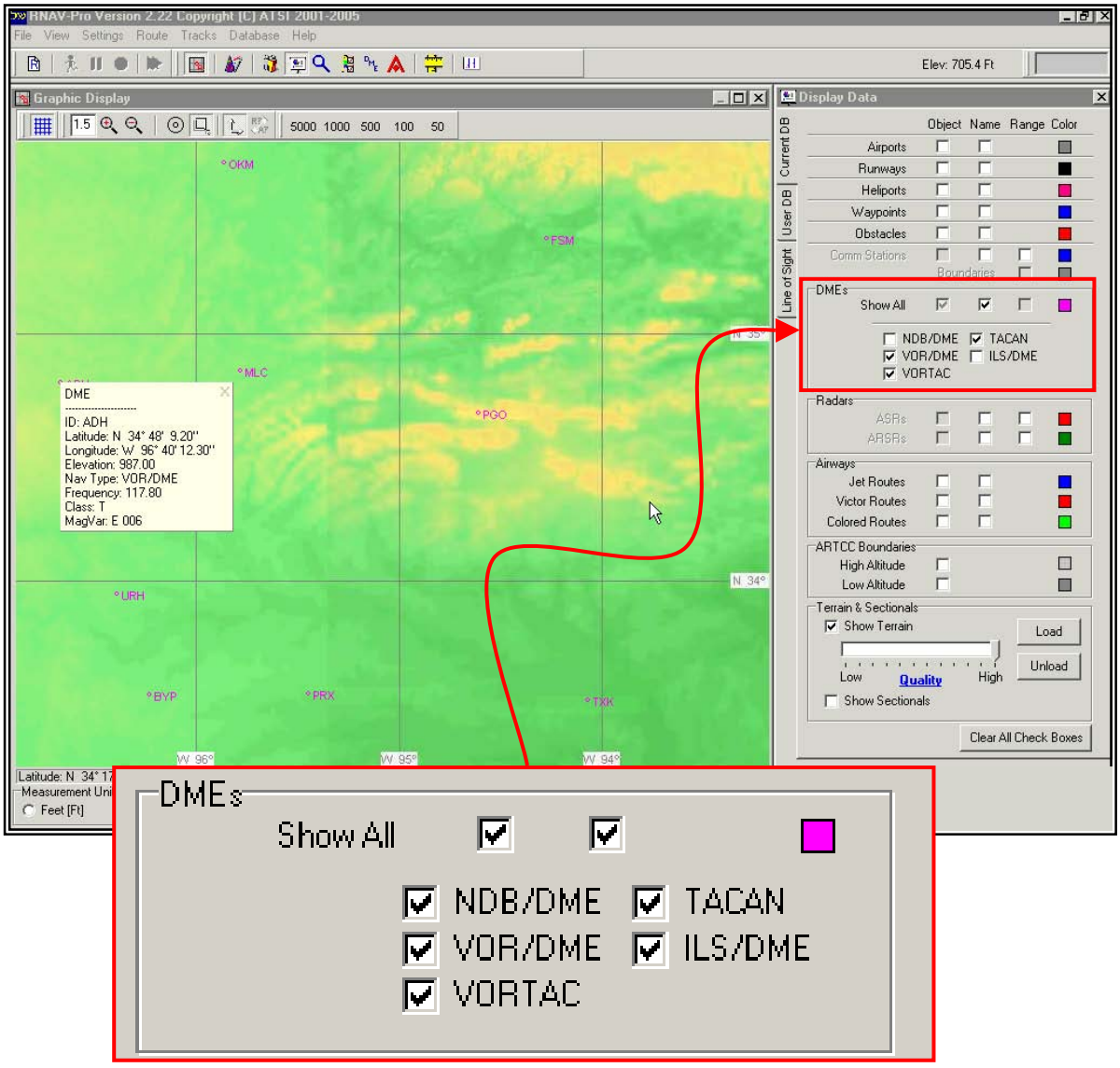


Figure 2-18: DMEs

The current database tab allows the user to select specific **radars** for Radar Screening by choosing the following checkboxes ion the Radar area:

- **ASRs:** Provides the user with **Terminal ASR radar** sites and shows range of coverage. Mouse identifies the name of the radar site for short-range (60-mile) radar.

- **ARSRs:** Provides the user with **Center ARSR radar** sites and shows range of coverage. Mouse identifies the name of the radar site for long-range (200-mile) radar.

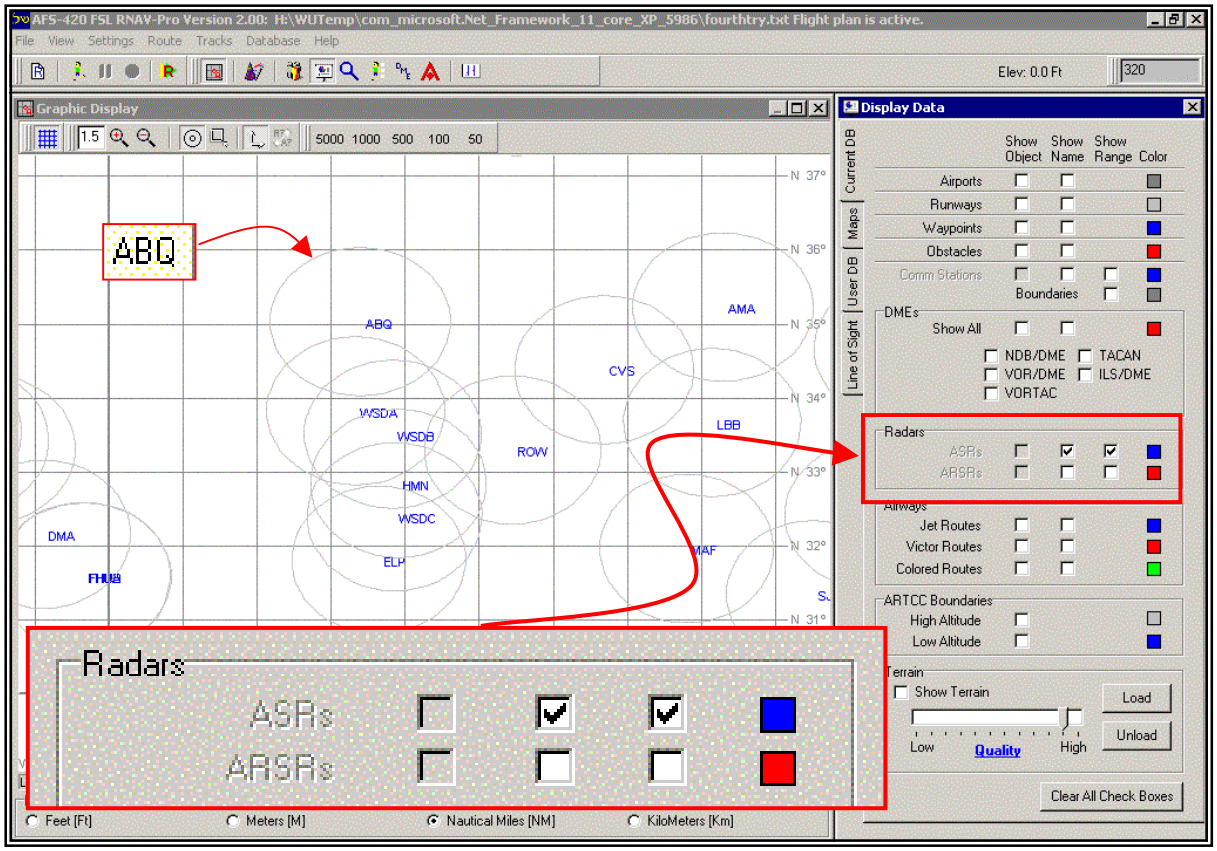


Figure 2-19: Radars (Name and Range)

In the Airways section of the Current Database Tab the user can select display of jet, victor, and colored routes. Three options are provided for each item: Object, Name, and Color.

- **Jet Routes:** Provides the user with jet routes in selected color. If the Name box is checked, all NAVAIDs, reporting points, and waypoints are shown. Rolling the mouse over the route provides the name.

- **Victor Routes:** Provides the user with low altitude airways in selected color. If the Name box is checked, all NAVAIDs, reporting points, and waypoints will be shown. Rolling the mouse over the route provides the name.

- **Colored Routes:** Provides the user with colored airways in selected color. rolling the mouse over the route provides the name.

ARTCC Boundaries: Displays high and low altitude ARTCC boundaries. If the Name box is checked, the Object and Color options are provided.

- **High Altitude:** Provides the user with Center high altitude boundaries. Rolling the mouse over the boundary provides the name of the controlling ARTCC.

- **Low Altitude:** Provides the user with Center low altitude boundaries. Rolling the mouse over the boundary provides the name of the controlling ARTCC.

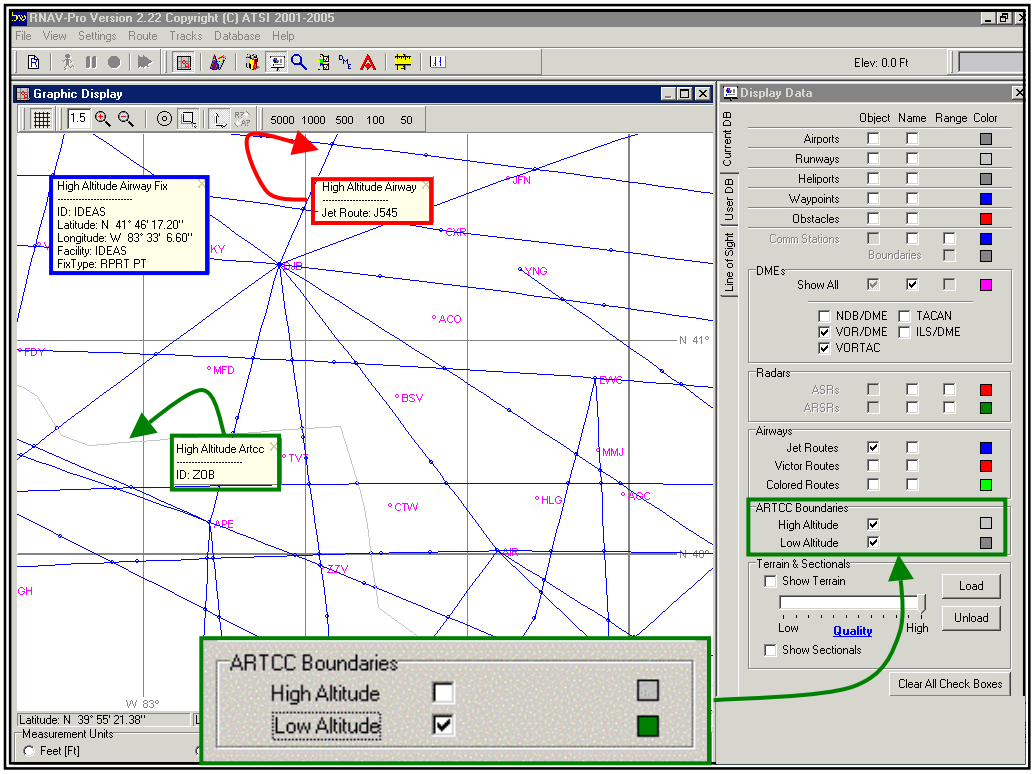


Figure 2-20: Airways and ARTCC Boundaries

In the Terrain and Sectional area of the Current Display Tab terrain can be displayed with the following options provided:

- **Show Terrain:** Selects DTED. When this checkbox is selected, DTED is not displayed until the DTED Load button is pressed.

- **Load Terrain:** Loads and displays the resolution determined by the Quality bar (discussed below).

- **Unload Terrain:** Allows the user to unload DTED. Pressing this button also unchecks the DTED checkbox.

- **Quality Bar:** Sets the optimum resolution for size of area selected in the Graphic Display.

Caution:	Loading DTED in a large area at a high resolution will result in a message advising to select a smaller area.

Note:	When DTED is loaded, the DTED Elevation (associated with the mouse location) appears to the right of the Square Button bar.

Note:	The TERPs Module uses DTED Level 1 which has an accuracy of 164 feet horizontally and 98 feet vertically or **Code 4E**. The Flight Simulation Module uses DTED Level 0 MAX.

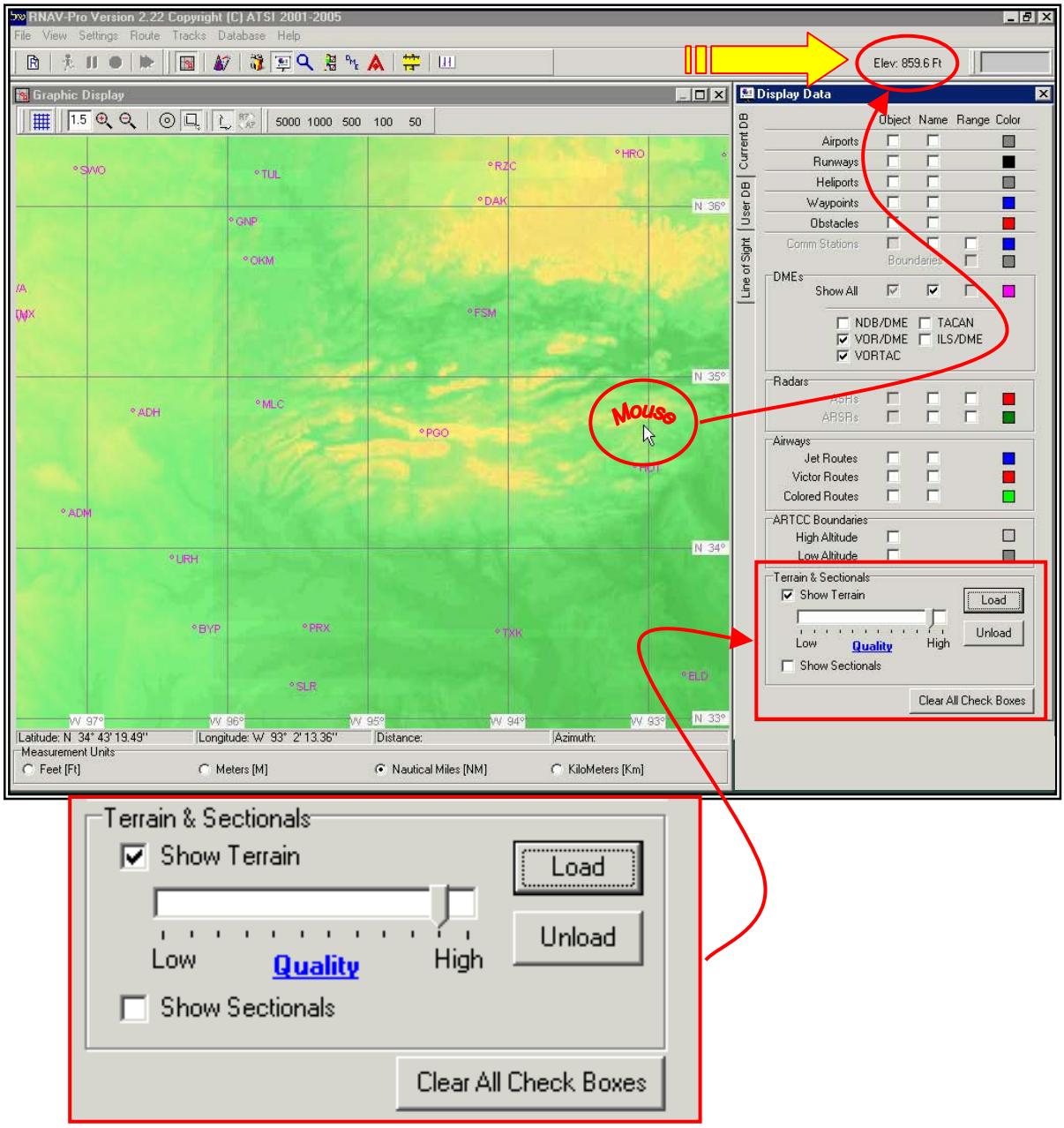


Figure 2-21: Show Terrain

The Terrain and Sectionals area of the Current Database Tab displays sectional charts when the user selects the checkbox. If DTED is selected with sectional charts, terrain data is provided.

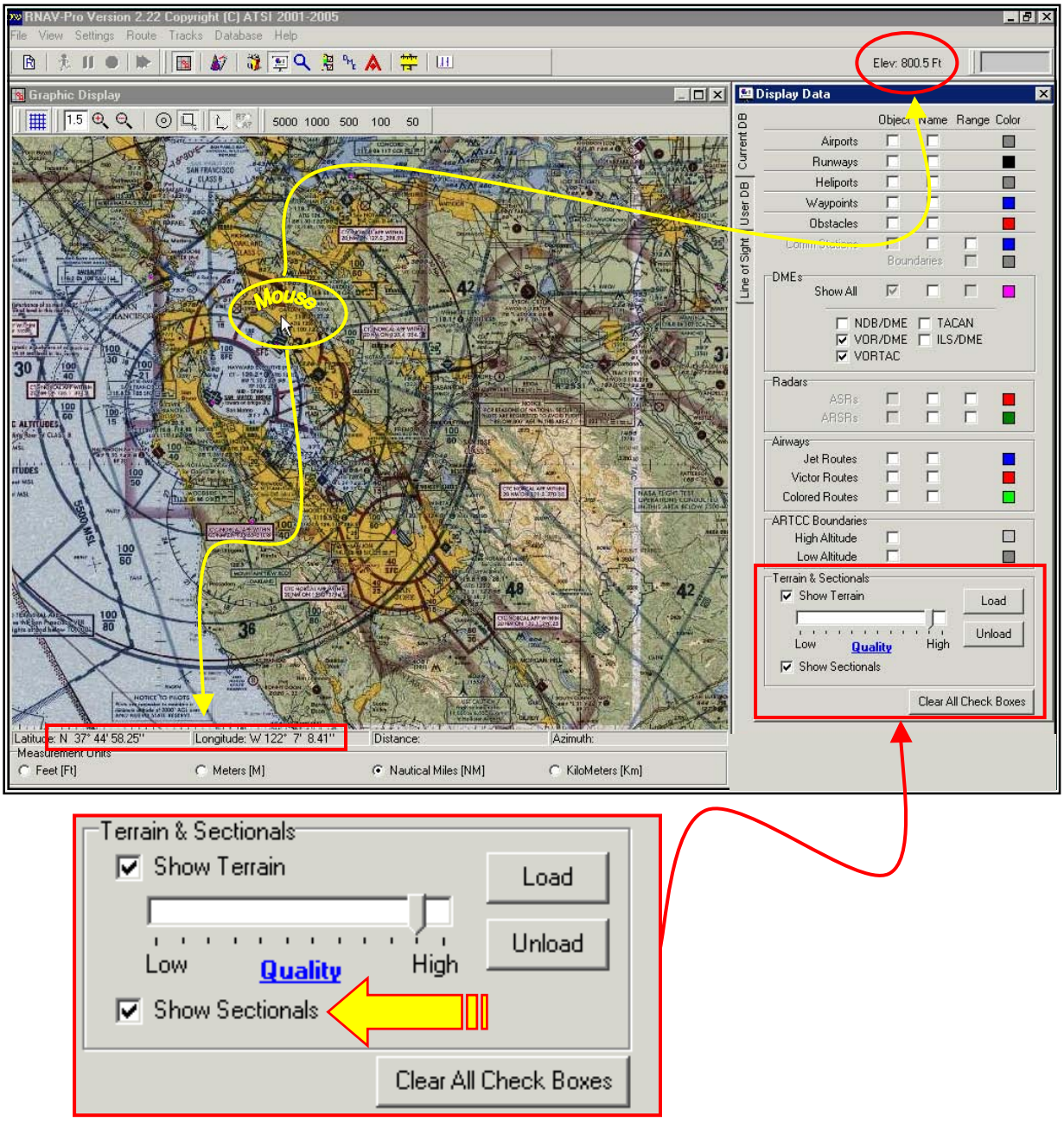


Figure 2-22: Show Sectionals

2.6.2.2 User Database Tab

The user creates the user database through the User Data Module (see Section 2.6.7). The user database is used to display the data once the user database is created. The user database includes DME facilities, obstacles, communication stations, and radar facilities (ASR and ARSR). Up to four options are provided for each item. The following checkboxes control the display of each item:

- **Show Object:** Displays location of the selected item on the drawing area.
- **Show Name:** Displays name of the selected items (if Show Object has also been selected).
- **Show Range:** Displays the coverage range (if Show Object has also been selected).
- **Color:** Allows the selection of color.

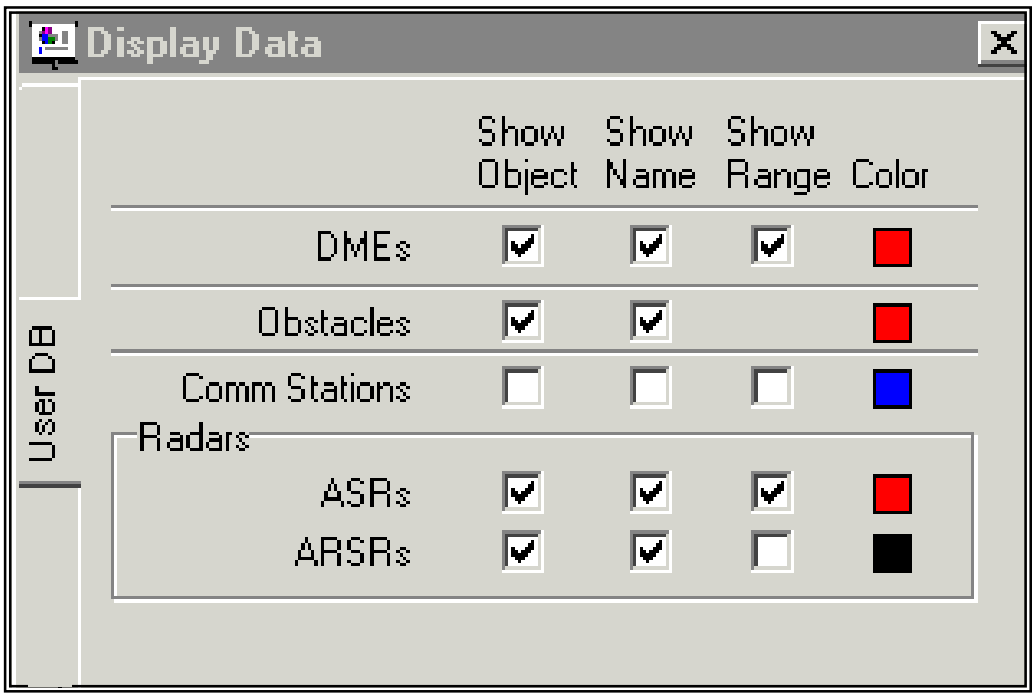


Figure 2-23: User Database Tab

2.6.2.3 Line of Sight Tab

RNAVPro line of sight assumes a value for the Earth's radius that is 4/3 times the actual radius. This is done to account for the effect of the atmosphere on radio wave propagation.

The Line of Sight allows the user to determine a line of sight between two latitude/longitude points and altitudes. It includes checkboxes and two Windows-style buttons:

- **Point One/Point Two:** Allows the user to define the two latitude/longitude points and altitudes with a mouse click in the Graphic Display. Latitude/longitude can be hand-entered.

- **Check Line of Sight:** Shows results on the Graphic Display in red or green and on the Line of Sight Tab as a **red box** for below line of sight and **green circle** for above line of sight.

- **View Graph:** Shows results in a profile view. Mouse pointer gives altitude data.

- **Clear:** Clears the Line of Sight line from the Graphic Display

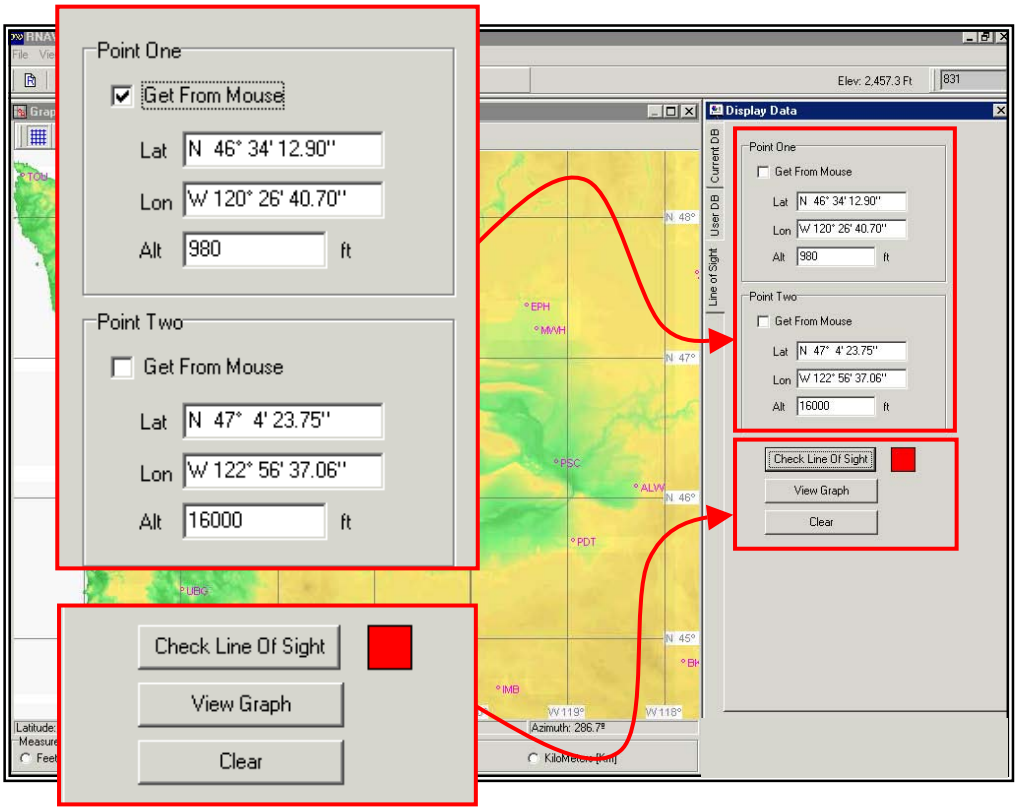


Figure 2-24: Line of Sight Tab

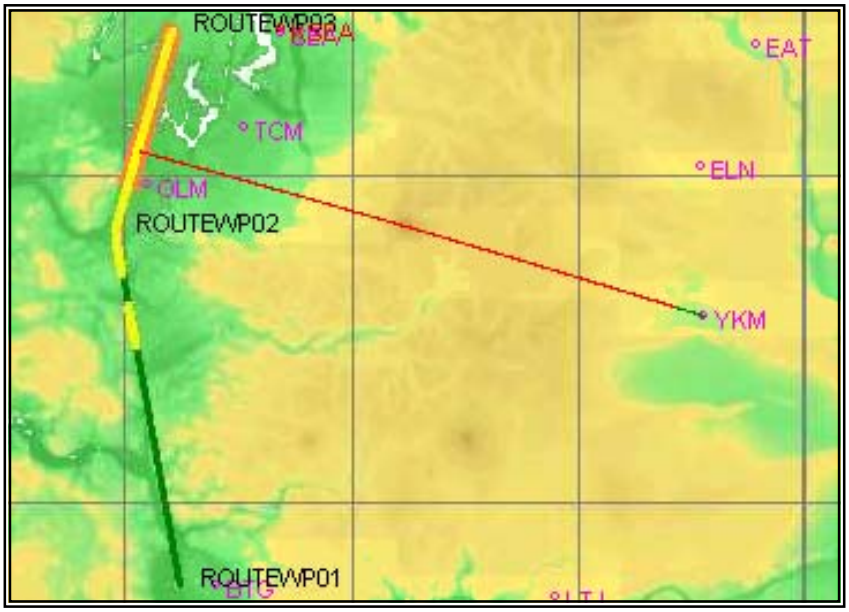


Figure 2-25: Line of Sight Tab/Graphic Display

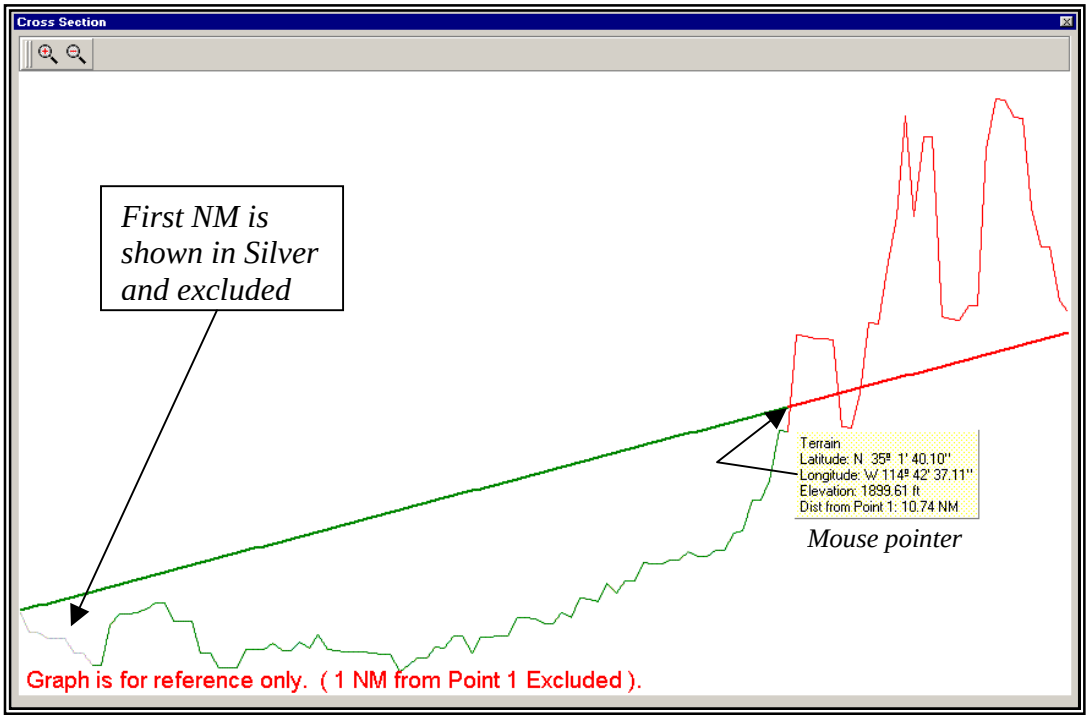
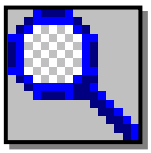


Figure 2-26: Line of Sight Tab/Cross Section



2.6.3 Search Data Module

The **Search Data Module** is used to search for selected airports, runways, waypoints, DMEs, radars, and airways via a Search Request.

Search Request:

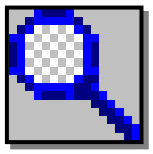
Searches the selected databases (Airports, Runways, Waypoints, DMEs, Radars, and/or Airways) for the item typed into the entry field. Results of the search appear in the Search Results (SR) area.

- **Entry field:** Allows the user to supply a specific item for which to search.
- **Database checkboxes:** Allows the user to select databases (Airports, Runways, Waypoints, DMEs, Radars, and Airways) in which to search for the item in the entry field.
- **Search:** Initiates the search. Results of the search then appear in the SR area (see Figure 2-25).

Search Results:

Once the item appears in the **Search Results (SR) area**, the following buttons are available:

- **Expand:** Enlarges the SR area to allow viewing of larger amounts of information. The expanded SR area includes a Close button to return to a normal viewing area.
    - The latitude/longitude of the item is displayed under the SR Area.
- **Select:** Displays the item(s) that has been highlighted in the SR area.
    - If the Center Around checkbox is selected, the item will be centered in the display.
- **Release:** Removes from Graphic Display area items that have been highlighted in the SR area.
- **Release All:** Removes from the Graphic Display all items located in the SR area.
- **Use for Departure:** Selects runway to be used for the departure. To do this highlight the desired runway in the SR area and then select this button.
- **Use for Approach:** Selects runway to be used for the approach. To do this highlight the desired runway in the SR area and then select this button.



Note:	The **Use for Departure** and **Use for Approach** buttons only appear when a runway has been highlighted in the SR area.

Note:	You must select a runway for subsequent TERPS analysis on departures/ approaches using the TERPS Module.

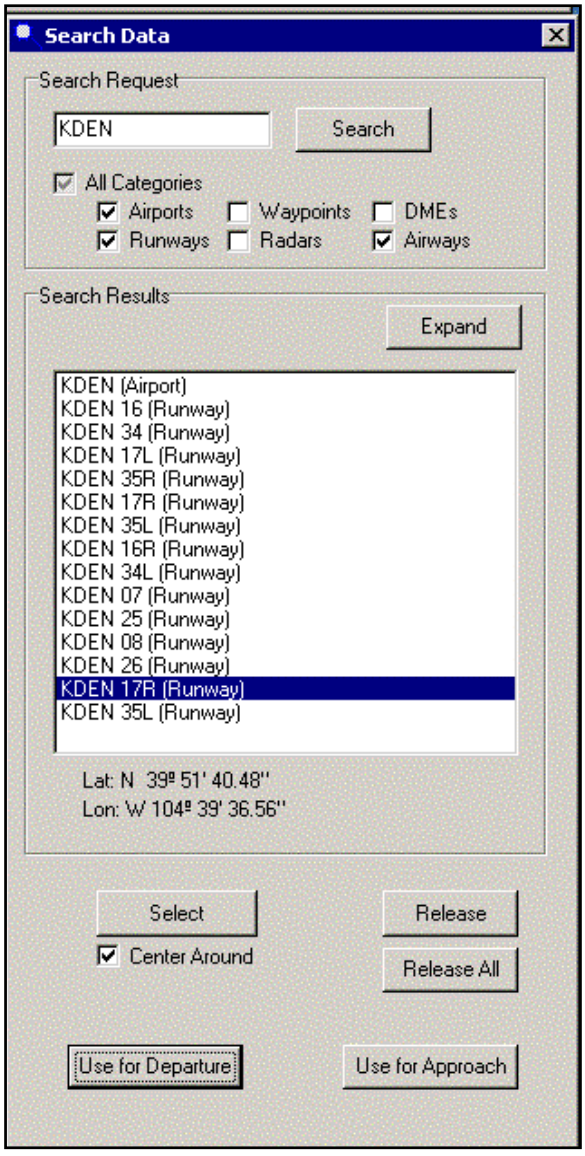
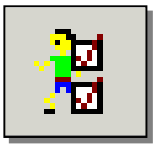


Figure 2-27: Search Data Module



2.6.4 Simulation Module

The Simulation Module has five tabs provided to input simulation information prior to running. **Flight Plans, Simulation Settings, Flight Settings, DME Specific Settings** and **Run Output.** They are:

2.6.4.1 Flight Plans Tab

This tab is used to load a flight plan.

The Load Flight Plan area includes the following Window-style buttons and checkboxes:

- **Load:** Allows the user to load or activate a flight plan track.
- **Add:** Allows user to load an additional flight plan track.
- **Remove:** Allows the user to remove a loaded flight plan track.
- **Save:** Allows the user to save a flight plan.
- **Zoom:** Centers the loaded flight plan in the Graphic Display.
- **Aircraft Category:** Allows the user to select aircraft approach categories A through E and B753 and B773.
- **Show Flight Plan WP Names:** Displays flight plan waypoint names in the Graphic Display.
- **Zoom when new flight is loaded:** When flight plan is loaded, zooms to area in the Graphic Display.

The Wind area allows the user to enter wind information to the following fields:

- **Velocity:** Is restricted to no greater than 30 KT.
- **Direction:** Is entered in a “From” format, opposite the true direction the wind is blowing.

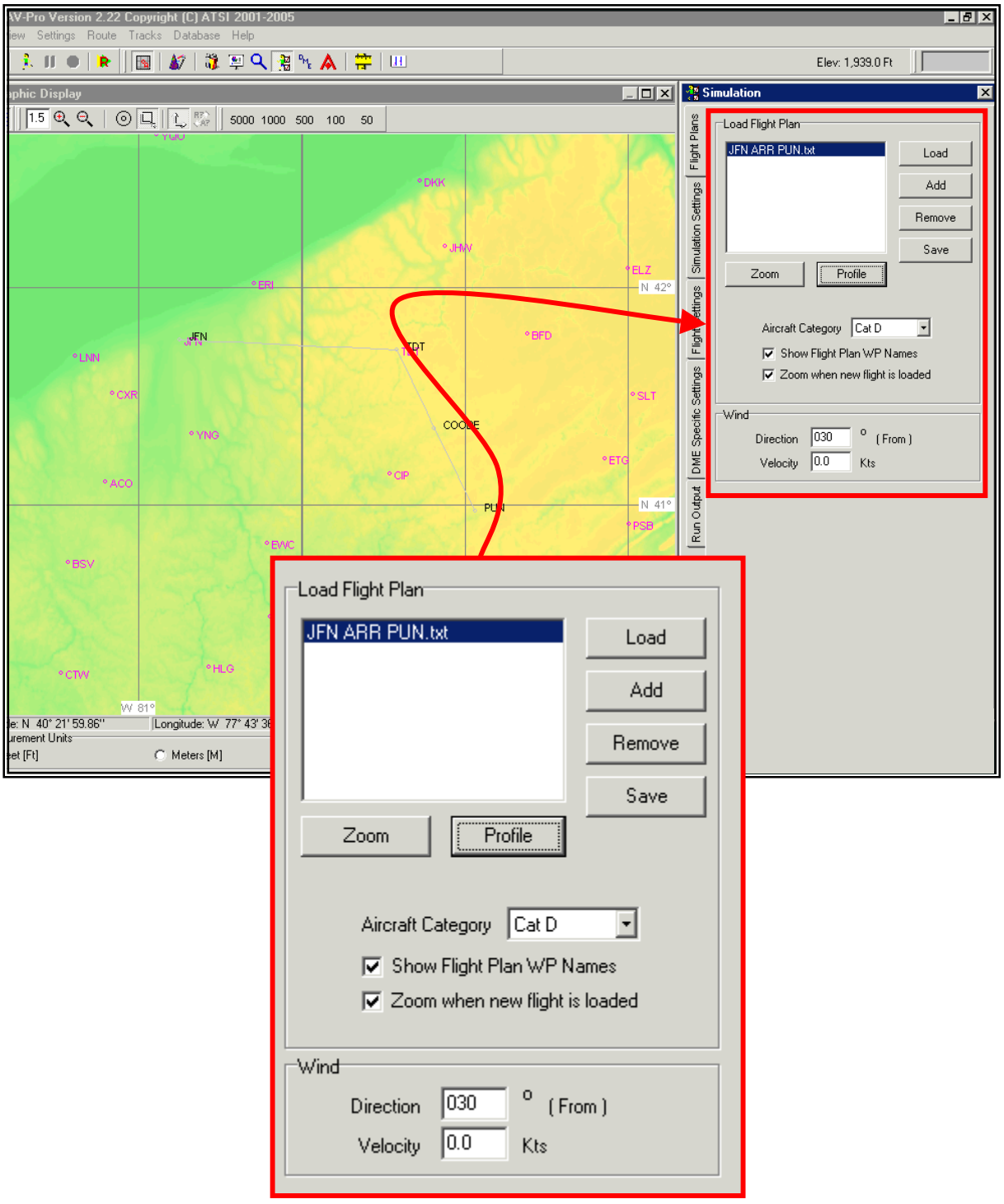


Figure 2-28: Flight Plans Tab

2.6.4.2 Simulation Settings Tab

This tab allows the selection of screening functions (Baseline Simulation Profiles and Screen Modes [Flyability, DME, Radars, Communications]) that the user desires.

The Baseline Simulation Profiles drop-down menu allows the user to select a simulation. The choices are shown in Figure 2-27.

When DME/DME is selected, the program automatically checks DME frequencies, checks RNP edges, identifies DME gaps and fills them with ESVs, rechecks for low/terminal DMEs if required, rechecks ESVs, and assigns Flight Check DMEs.

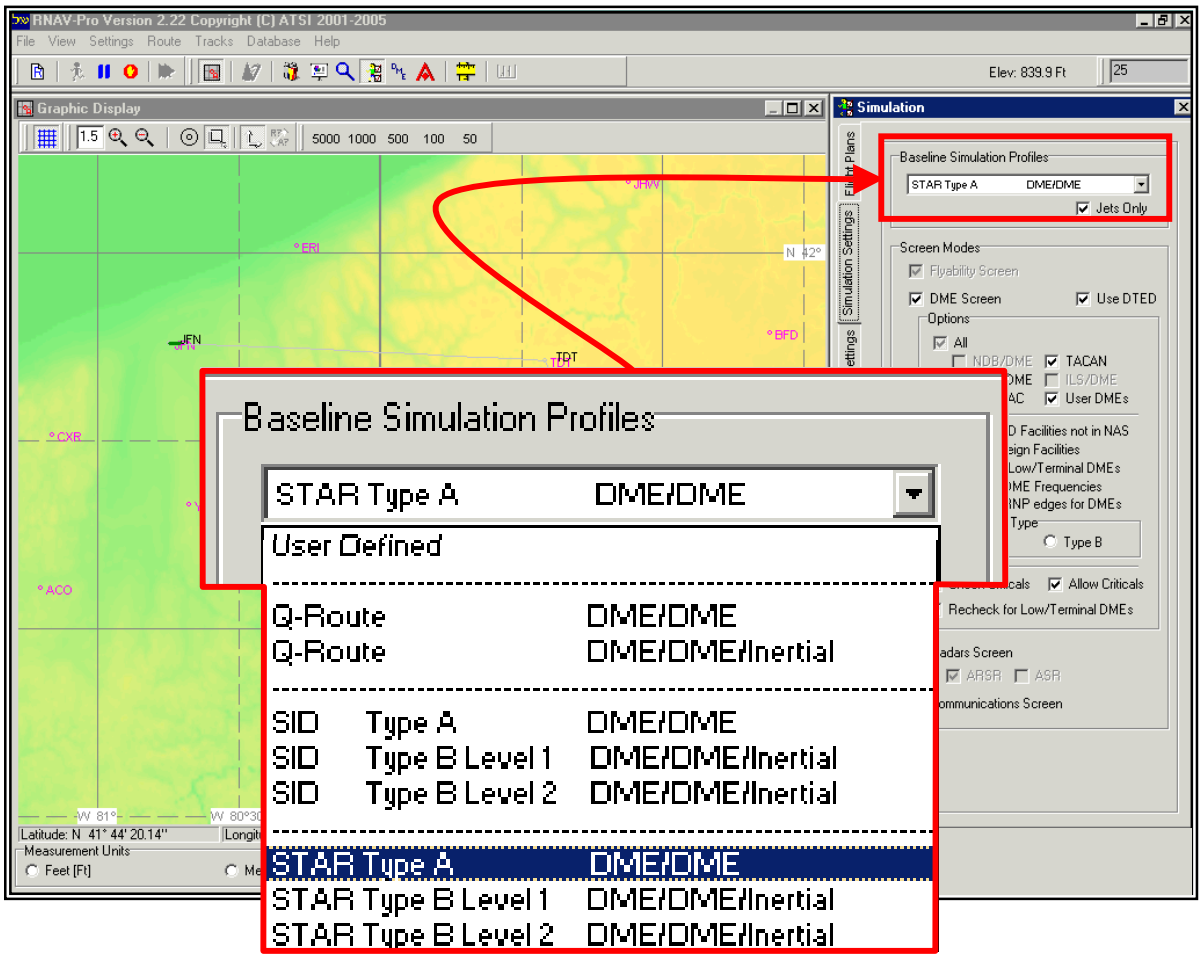
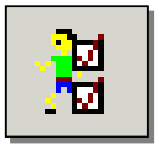


Figure 2-29: Baseline Simulation Profiles



The **Screen Mode** areas include the following options:

- **Flyability Screen:** The model determines flyability for the specified category/type of aircraft.

- **Use DTED:** Elevation data is used for screening. It is suggested that the DTED checkbox be selected in most instances.

- **DME Screen:** The user sets conditions, and the sophisticated Kalman Filter DME/DME screening model determines if sufficient DME availability exists.

- **Options:**

    - **DME Types:** Includes six checkboxes for selection of DME type.

    - **Use DOD Facilities Not in the NAS:** Allows selection of DOD facilities for screen.

    - **Use Foreign Facilities:** Allows selection of foreign facilities for screening.

    - **Disable Low/Terminal DMEs:** Excludes use of low or terminal facilities for screening.

    - **Check DME Frequencies:** Excludes the use of two facilities with a common frequency.

    - **Check RNP Edges for DMEs,** Verifies coverage left and right of centerline. Geometry and DME solution pairs are checked at both edges ensuring DME coverage at all 3 points (left, right, and centerline). If geometry is not available, the program informs the user both graphically and in the Results Window.

    - **SID/STAR Type:** Type A is DME/DME navigation only, and Type B is DME/DME and inertial navigation.

    - **Critical DMEs:** Following the initial run, subsequent runs determine which facilities are critical. Each subsequent run disables one DME to determine if the selected route is satisfactory with that DME removed from service. Critical DMEs are depicted on the Graphic Display in orange. See Figure 2-31.

- **Allow Criticals:** Result Summary indicates DME passed even though Critical DMEs are present. Used when screening arrivals and departures where critical DMEs are allowed.

- **Recheck for Low/Terminal DMEs:** When low or terminal facilities are part of the solution, this program automatically checks above the facilities for a solution using an appropriate facility (i.e., high facility). If no coverage is available at these higher altitudes, then the program informs the user of the problem and suggests a possible solution. This portion of the simulation run is depicted on the Graphic Display in purple during the run only. See Figure 2-31.

- **Radars Screen:** Given conditions selected by the user, determines if sufficient radar coverage is available along the entire route of flight.

- **Communications Screen:** Given conditions selected by the user, determines if sufficient communications coverage is available along the entire route of flight.

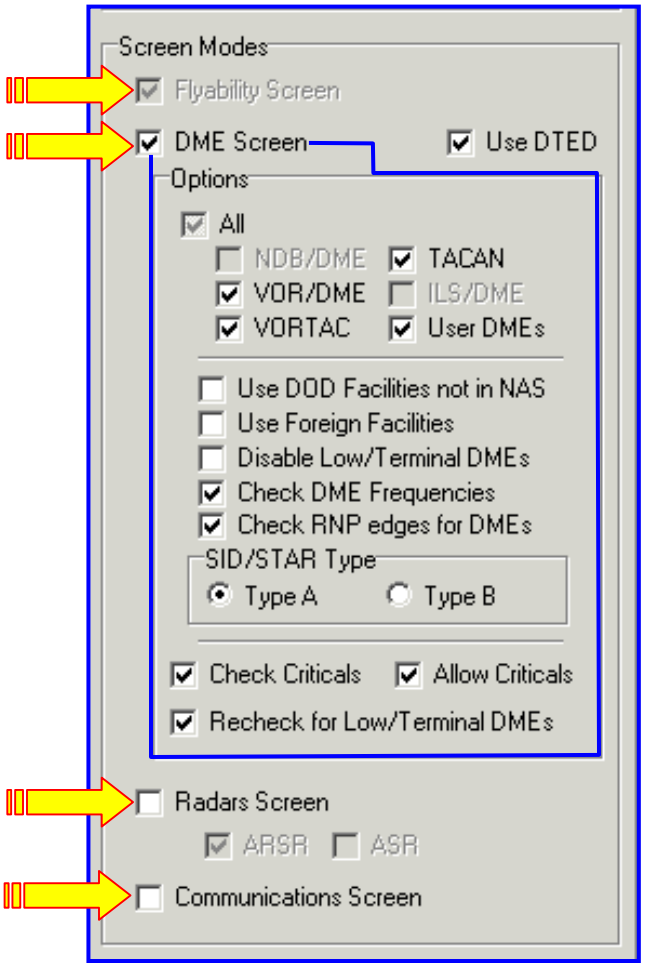


Figure 2-30: Screen Modes

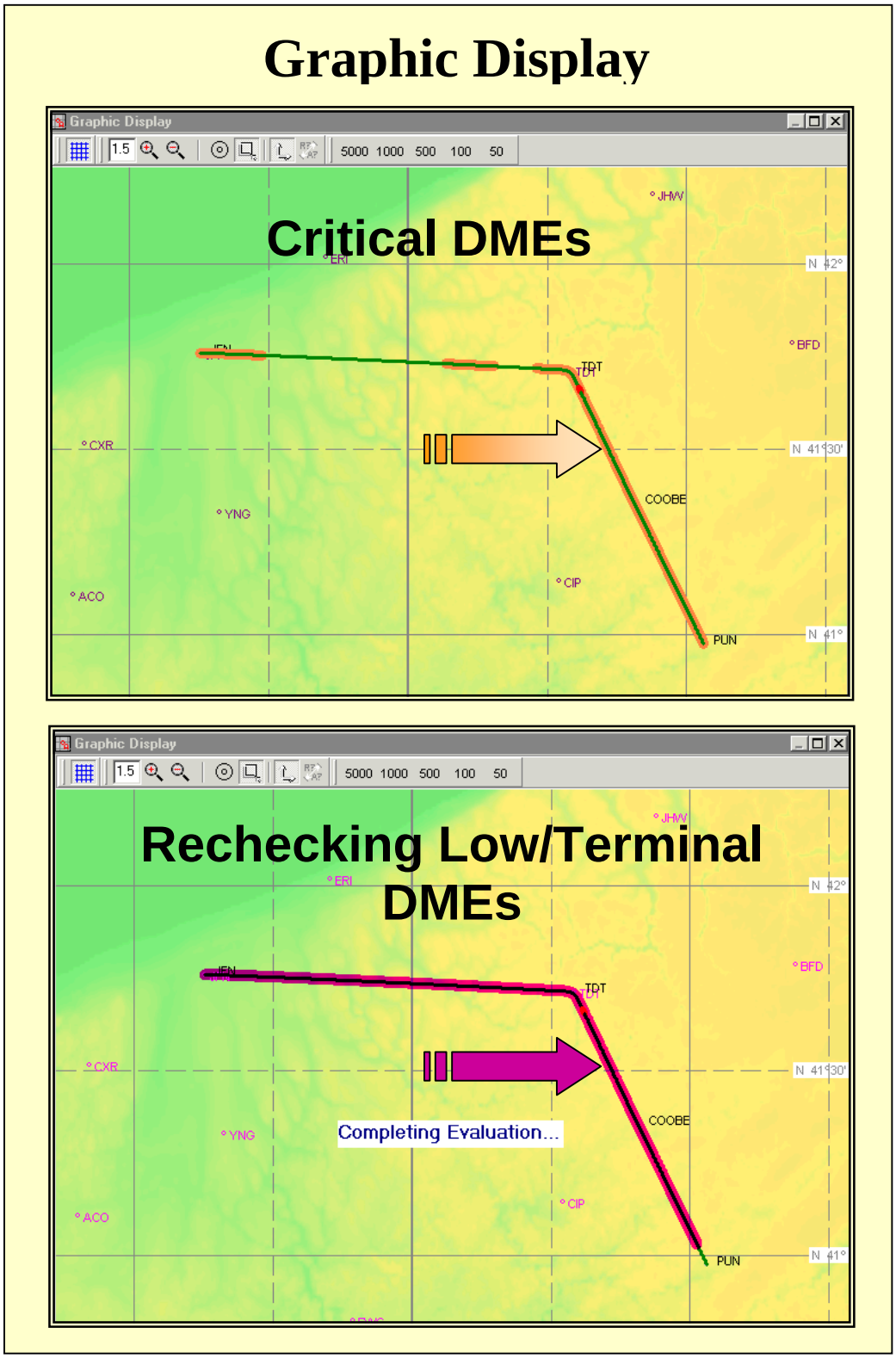
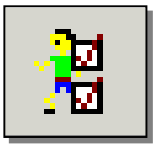


Figure 2-31: Simulation Settings Tab/DME Screen



2.6.4.3 Flight Settings Tab

This tab allows the selection of screening functions (Climb Gradient, Ground Speed) the user desires, and provides a calculator to convert IAS to ground speed and vice versa.

Climb Gradient: Allows the user to set a climb gradient up to an altitude

- **Set Climb Gradient of:** Standard departure climb is 200 feet per nautical mile.

Ground Speed: Allows the user to set ground speeds.

- **Use Ground Speeds for Flight:** Ground speeds shown are recommended for simulation runs.
    - **Ground Speed Inputs:** Allows the user to assign ground speed of choice.
    - **Additional Departure Restriction:** Allows the user to set airspeed out to a specific distance.
    - **Calculate Indicated and Ground Speeds:** Allows the user to calculate the conversion of IAS to ground speed or vice versa.
    - **Uses ISA conditions:** Indicates calculations are based on International Standard Atmosphere.

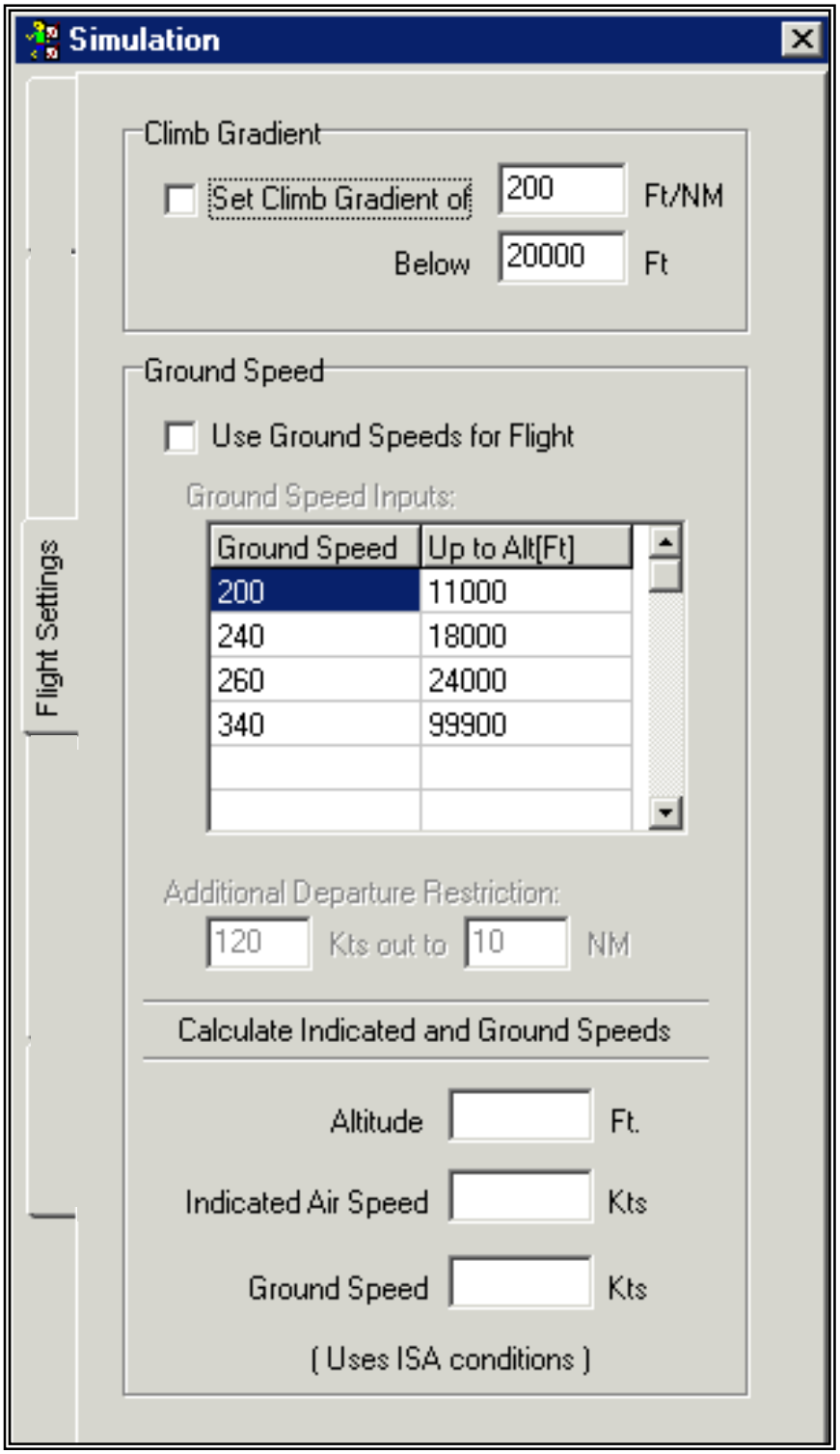
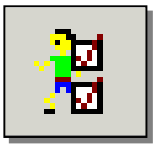


Figure 2-32: Flight Settings Tab



2.6.4.4 DME Specific Settings Tab

This tab is used to input DME Screening requirements and provide information on RNP values, flight modes, DME Screen settings, INS drift settings and flight check DME settings.

Required Navigation Performance (RNP) Value:

- **Radial buttons:** Allow the user to select RNP values (0.3, 1.0, 2.0, 4.0, or Auto 1.0/2.0).
- **Route Width:** Displays route width based on RNP value selected.
- **Max Error:** Displays the maximum allowed error.

Flight Mode:

- **Radial buttons:** Allow the user to select the flight mode.

Screen Settings:

- **Minimum Range from DME:** Through the use of an entry field and subsequent radial buttons, allows the user to select a minimum reception range from a DME. The default value is 3 NM.
- **Allowed Gap Length:** Displays the maximum allowable error in NMs.
- **Use SSV:** If selected, applies Standard Service Volumes as specified in FAA Order 8260.1A. If a facility does not have a terminal, low altitude, or high altitude identification, then the DME is ignored during screening.
- **Use OSV:** If selected, applies the Operational Service Volume as specified in FAA Order 8260.1A.
- **Test for ESV:** If solution requires an Expanded Service Volume (ESV) automatically establishes an ESV and repeats the screening process to test the ESV.

INS (Inertial Navigation System) Drift Settings:

Allows the user to control INS drift settings by the use of checkboxes and entry fields.

- **Allow INS Drift:** Enables INS drift for flight simulation.
- **Drift:** Allows the user to select the amount of drift.
- **Initial Drift (SID):** Displays the maximum amount of drift for a Standard Instrument Departure (SID).

- **Initial Drift (STAR/Q-Rte):** Displays the maximum amount of drift for a STAR and Q-route.
    - **Max Allowed Drift Time**: Displays the maximum amount of drift time.
    - **Automatic Inertial if DME/DME Fails:** Allows the program to solves for a DME/DME solution, including DME gaps, before it enables the simulator to solve with inertial drift.

Flight Check DME Settings:

- **Automatically Select During Screen:** Allows the program to automatically select and assign Flight Check DMEs during the screen.
- **Only Use Selected DMEs:** Allows user to manually select the 5 DMEs for Flight Check.
- **Assign Flight Check DMEs:** Displays DME Selection Screen.

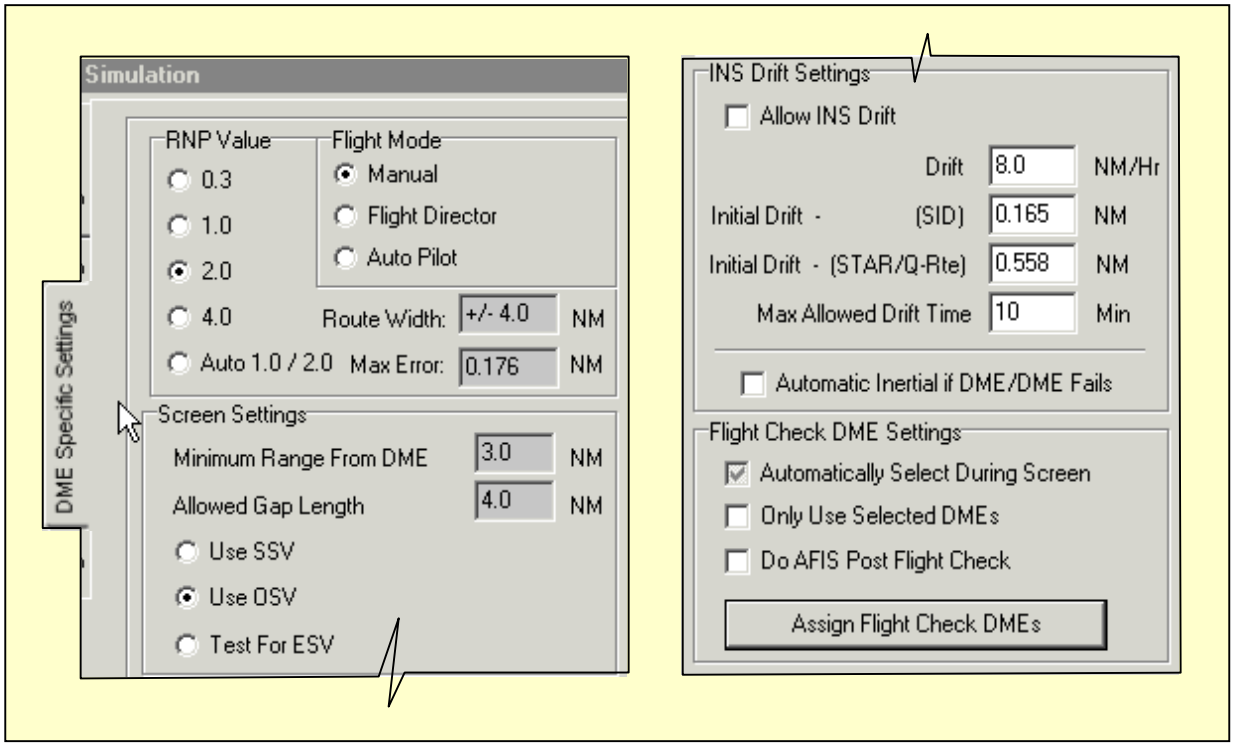
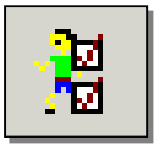


Figure 2-33: DME Specific Settings with Baseline Settings



2.6.4.5 Run Output Tab

This tab allows the user to observe the simulation output as the simulation is run.

- **DMEs Used & Status:** Shows the following program-supplied information:
    - **Minimum MSL DMEs Available:** Displays the minimum altitude in feet on departures at which two DMEs are able to detect an aircraft and perform a DME/DME solution.
    - **Solving With:** Provides real-time information as route is screened. It identifies the number of DMEs selected for the screening analysis and the number of DMEs available for selection.
- **DME/INS Errors:** Displays program-supplied information and allows the user to determine whether output is shown.
    - **Actual:** Provides real-time Navigation System Error (NSE) information as route is screened.
    - **Max:** Provides real-time NSE information as route is screened.
    - **Max Allowed:** Displays maximum allowed NSE (dependent on selected RNP value and flight mode).
- **Don't Show Output (Fast Mode) or (Allow Breaks):** Restricts viewing of the flight track on Graphic Display. Run time is much faster in this configuration.
- **Run Time:** Displays time in minutes and seconds to run the simulation.
- **Track Coloring Options:** Allows selection of track coloring through the use of radial buttons.

Note:	While INS drift is occurring, the upper right corner of the DME/INS Errors area displays an "INS" over a yellow circle as shown here.	

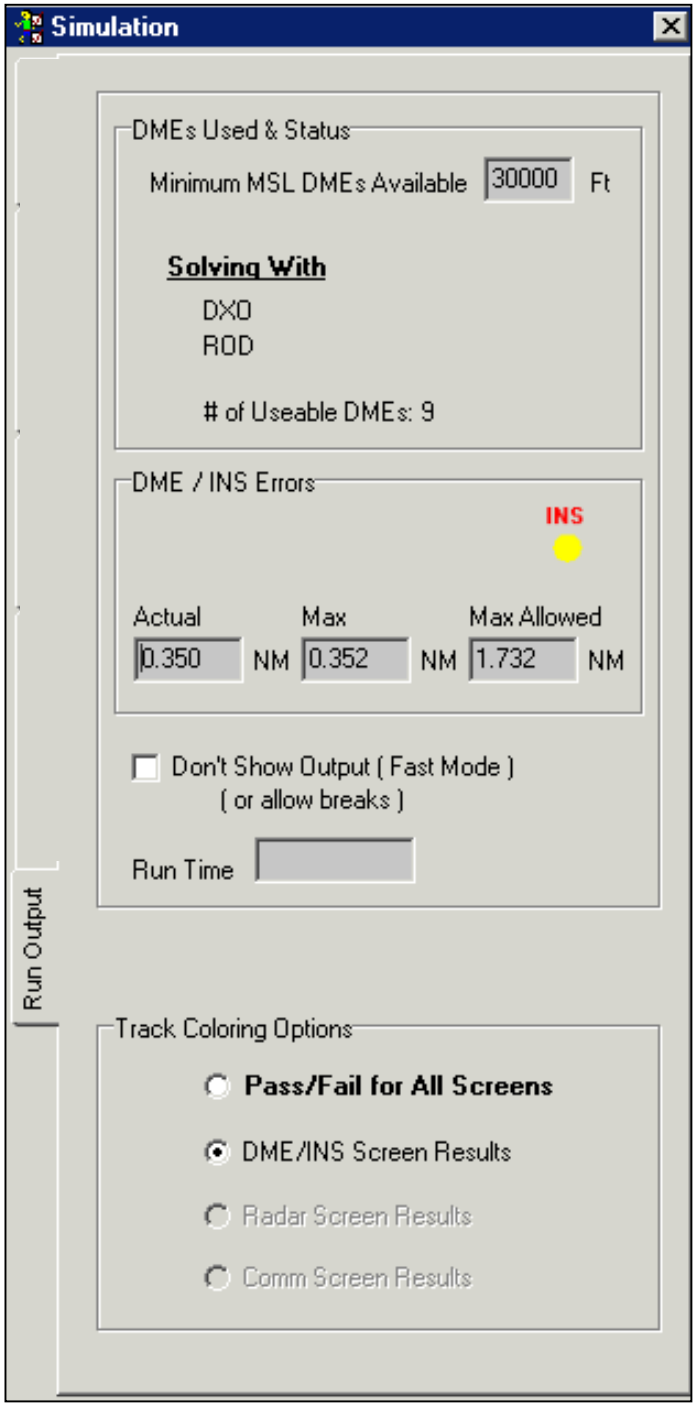
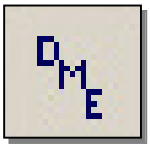


Figure 2-34: Run Output Tab



2.6.5 DME Extras Module

This module has three tabs: **Create DME Areas, Evaluate DME Areas,** and **SV Cross Section**. This module can be opened with the View drop-down menu or the DME square button.

2.6.5.1 Create DME Areas Tab

This tab allows the user to create a rectangle or non-uniform shape grid using the mouse or by specifying latitude and longitude in entry fields.

Use Rectangle: Is selected with a radial button.

- **From Mouse:** Allows the user to define a rectangle area by selecting the checkbox and clicking on a location on the Graphic Display.

- **Grid Bottom Left:** Allows the user to define the bottom left corner of a rectangular grid area on the Graphic Display by imputing latitude and longitude coordinates.

- **Grid Top Right:** Allows the user to define the top right corner of a rectangular grid area on the Graphic Display by using the same procedure as described for Grid Bottom Left.

Use Non Uniform Shape: Is selected with a radial button and allows the user to define a polygon grid area on the Graphic Display.

- **From Mouse:** Allows the user to define the polygon area by selecting the checkbox and clicking on a location on the Graphic Display.

- **Plus/Minus:** Allow the user to add or delete blank lat/lon boxes if more or less are needed.

- **Show Grid:** Allows the user to display the grid on the Graphic Display.

Grid Definition/Create Grid/Clear All: Allows selection of grid intervals and units and activates creation or deletion of a grid using entry fields, radial buttons, and Windows-style buttons.

- **Lat Step:** Allows user to enter desired intervals between parallels of latitude.
- **Lon Step:** Allows user to enter desired intervals between meridians of longitude.
- **Units:** Allows selection of meters, feet, or nautical miles for defining the grid sizes.
- **Create Grid:** Creates and displays the grid on the Graphic Display.
- **Clear All:** Erases the grid from the Graphic Display.

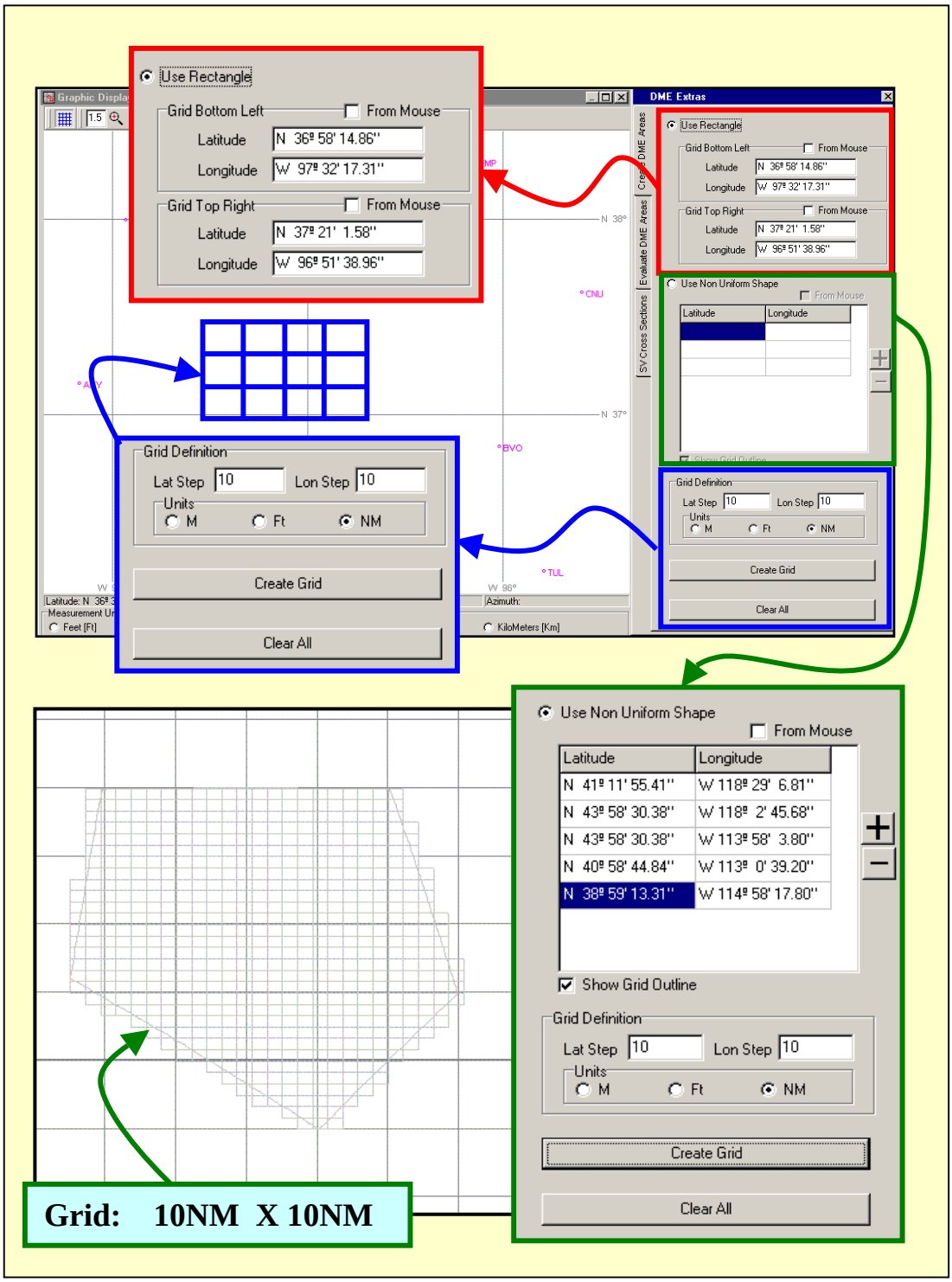
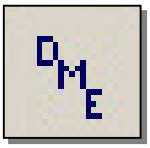


Figure 2-35: Create DME Areas Tab



2.6.5.2 Evaluate DME Areas Tab

This tab allows the user, through various entry fields, checkboxes, and radial buttons, to evaluate a DME grid for either:

- Minimum altitude coverage with/without DME Criticals.
- Multiple Altitude Slices for solution analysis.

Evaluation Settings:

- **Altitude:** Automatically shows final altitude where DME coverage is reached.

- **DME Types:** Includes four checkboxes for selection of DME type.

- **OSV Areas Used for All DMEs**: Utilizes Operational Service Volume (OSV) used for DME facilities.

- **Check DME Frequencies:** Excludes the use of two facilities with a common frequency.

- **Use DTED:** Activates DTED.

- **Use DME Restrictions:** Assigns restrictions to the NAVAIDs.

- **Scan for Min. Passing Alt.:** Allows the user to select altitude slices (500 feet, 1000 feet, etc).

- **Consider Criticals Failure:** Determines which set of DME pairs are critical. The scan continues until it finds an altitude that has redundant coverage.

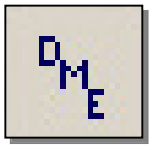
Display Options: Checkboxes allow selection of:

- **Show Grid**
- **Show All Coverage**
- **No Coverage:** Indicated by a red box.
- **1 Pair Avail:** Indicated by a yellow box.
- **2 Pairs Avail:** Indicated by a blue box.
- **3+ Pairs Avail:** Indicated by a green box.
- **Criticals**: Indicated by an X over any of the colored boxes above except red.

Evaluate: Windows-style buttons that starts the evaluation.

Stop Evaluation: Windows-style buttons that ends evaluation.

View Results: Windows-style buttons that shows DME Area Assessment and allows user to save as HTML file.



Multiple Altitude Slices: Allows the user to select altitude parameters using entry fields and Windows-style buttons.

- **Minimum Altitude:** Sets minimum altitude.
- **Maximum Altitude:** Sets maximum altitude.
- **Altitude Step:** Selects altitude steps (500, 1000, etc.).
- **Generate Multiple Altitude Slices:** Starts the evaluation.
- **Show:** Opens the View Multiple DME Altitudes Window.

Clear All: Erases all data from module and Main Display Window.

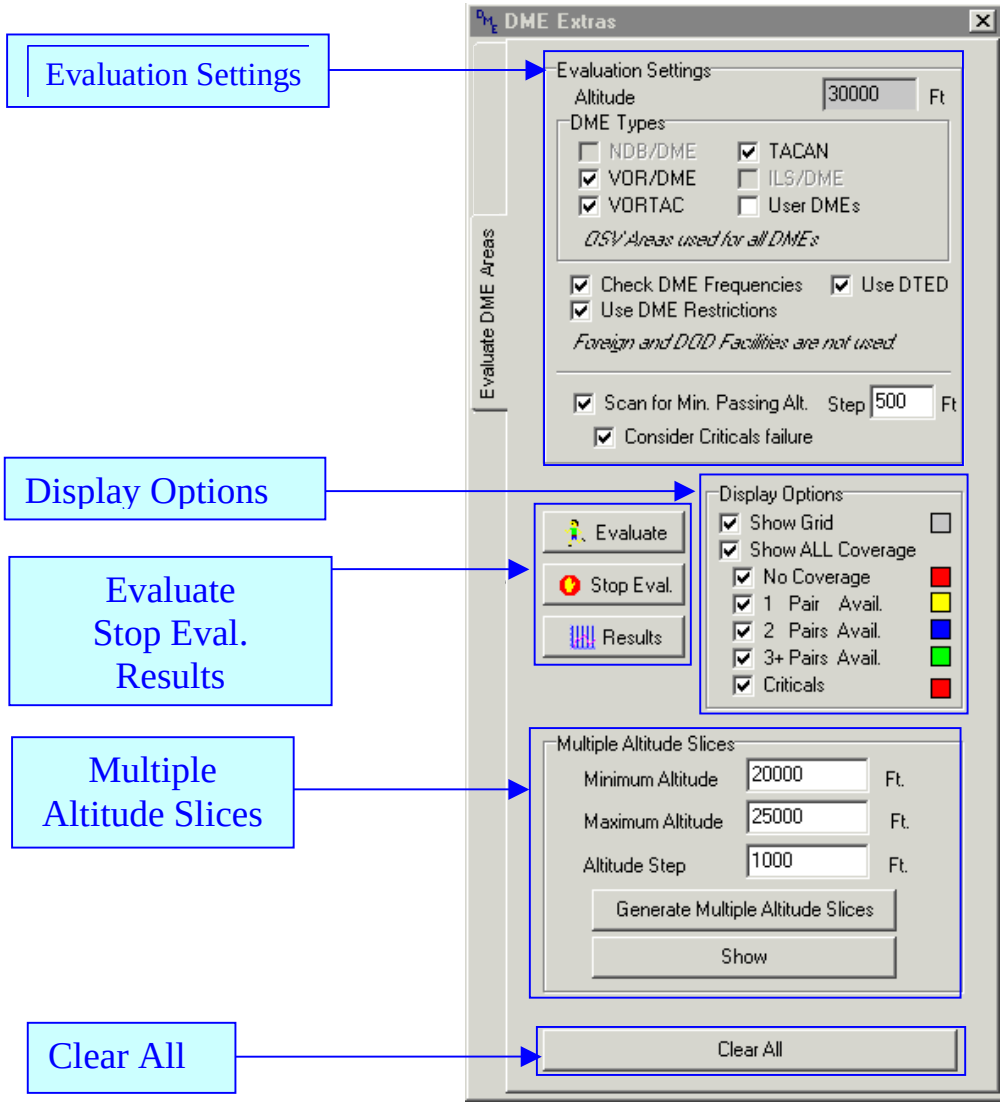


Figure 2-36: Evaluate DME Areas Tab

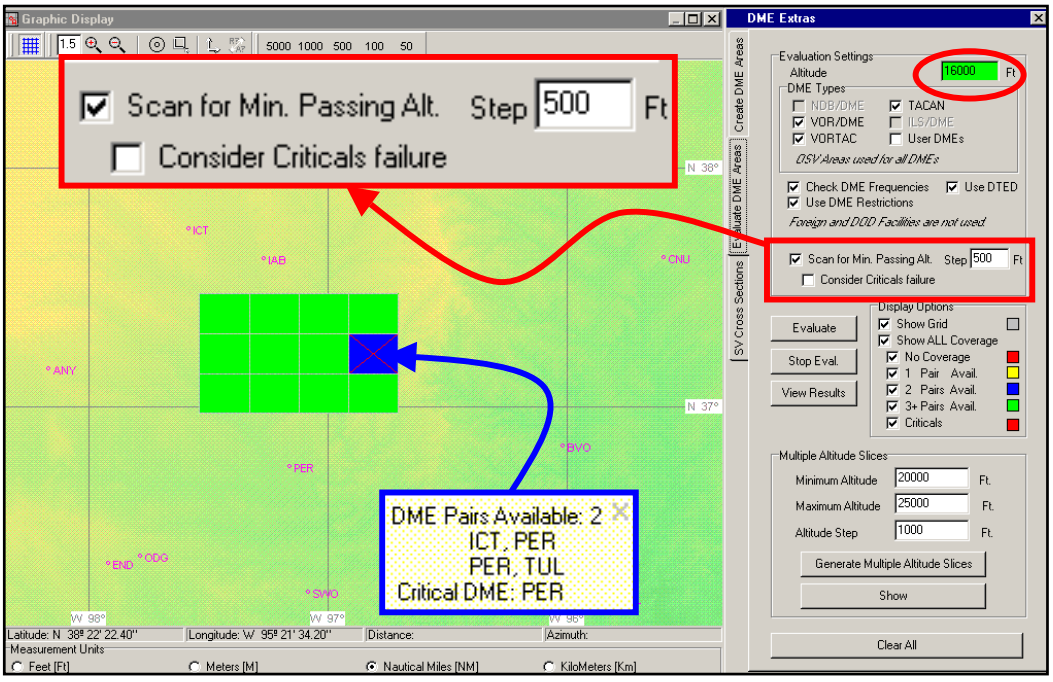


Figure 2-37: Evaluate DME Areas Tab/Criticals Allowed

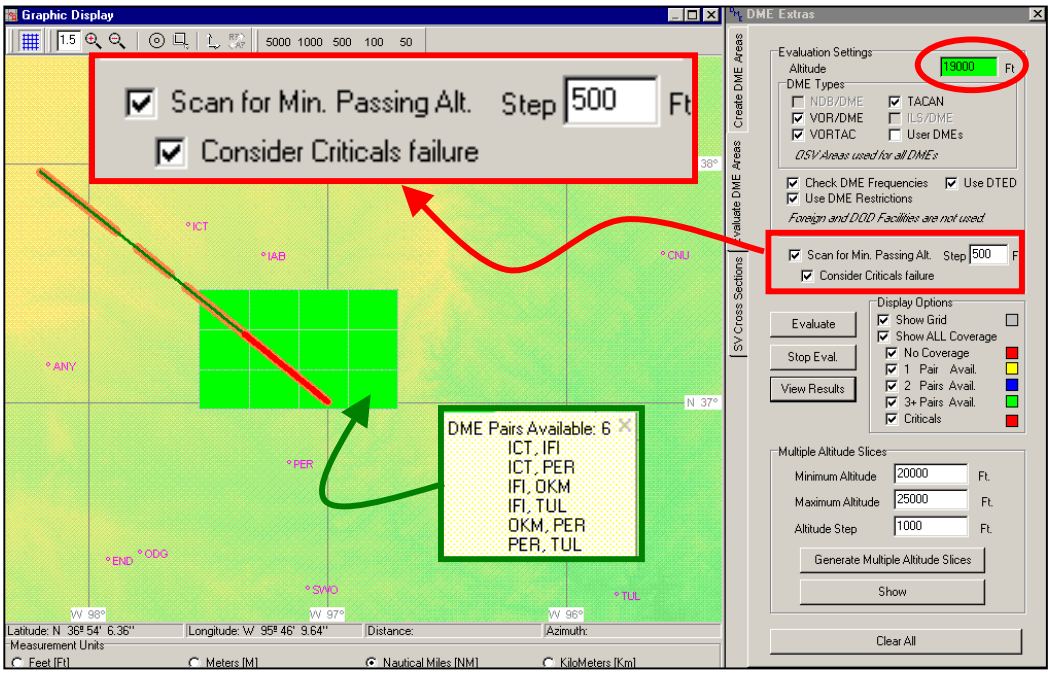


Figure 2-38: Evaluate DME Areas Tab/Criticals Not Allowed

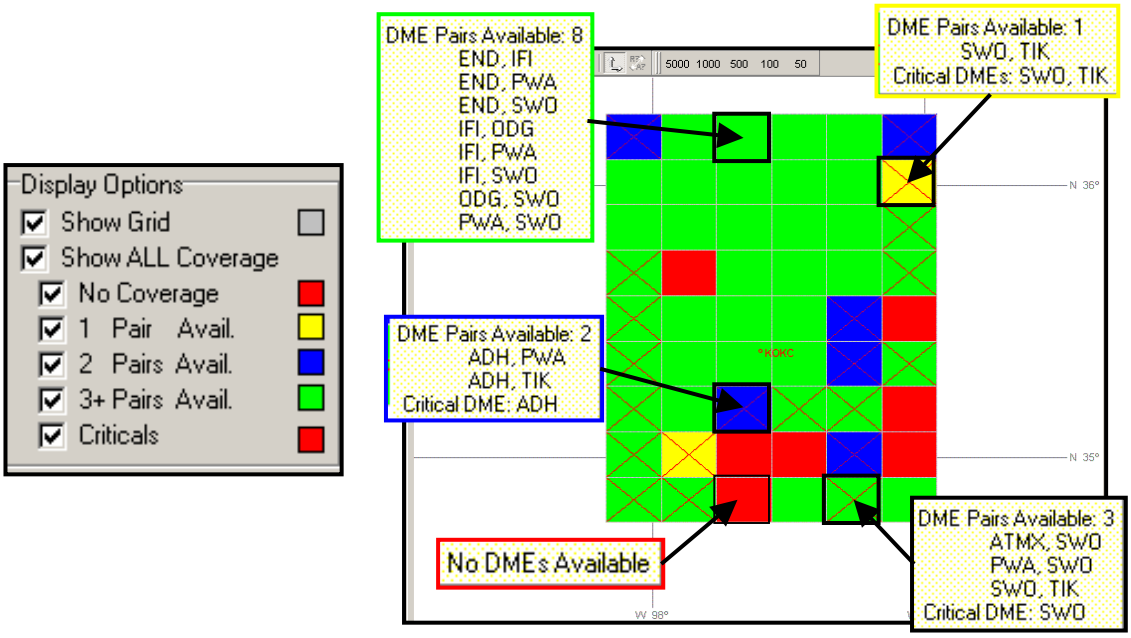


Figure 2-39: DME Pairs Graphic Display

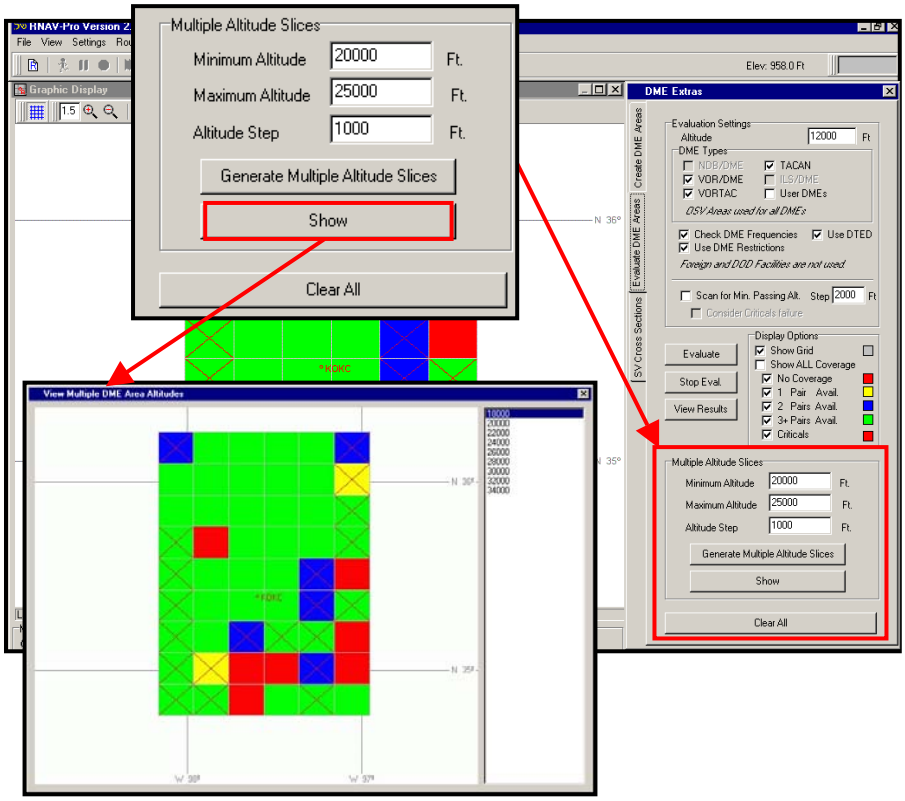
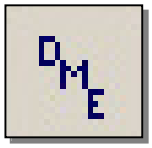


Figure 2-40: Evaluate DME Areas Tab/Multiple Altitude Slices



2.6.5.3 SV Cross Section Tab

This tab allows the user to specify facility and service volume options using a checkbox, entry fields, radial buttons, and a Windows-style button.

Facility/Service Volume:

- **Facility:** Allows the user to select NAVAIDs by using the mouse to click on the location of the NAVAIDs on the Main Display Window to establish the location by lat/lon.

- **Service Volume:** Radial button that defaults to the service volume (terminal, low altitude, or high altitude class service volume) of the selected facility.

Terrain: Allows the user to activate the terrain option within the cross section display of this tab using a checkbox, entry fields, and a Windows-style button.

- **Azimuth:** Allows the user to specify 360 degrees of azimuth from which to view the cross section. The specific degrees entered in the azimuth window is the azimuth of the right side of the cross section.

- **Load DTED:** Activates DTED.

- **Use:** Displays the cross section.

- **Use for Evaluation:** Allows DTED readout of azimuth, altitude, and line-of-sight function within the Cross Section window.

Cross Section Window: The window is interactive with the mouse and displays line of sight altitude, and range.

- **Zoom In/Out:** Allows the user to zoom in or out within the Cross Section Window.
- **Visible:** Provides line-of-sight information (Yes/No).
- **Altitude:** Provides altitude in MSL.
- **Range:** Provides distance from the NAVAIDs.

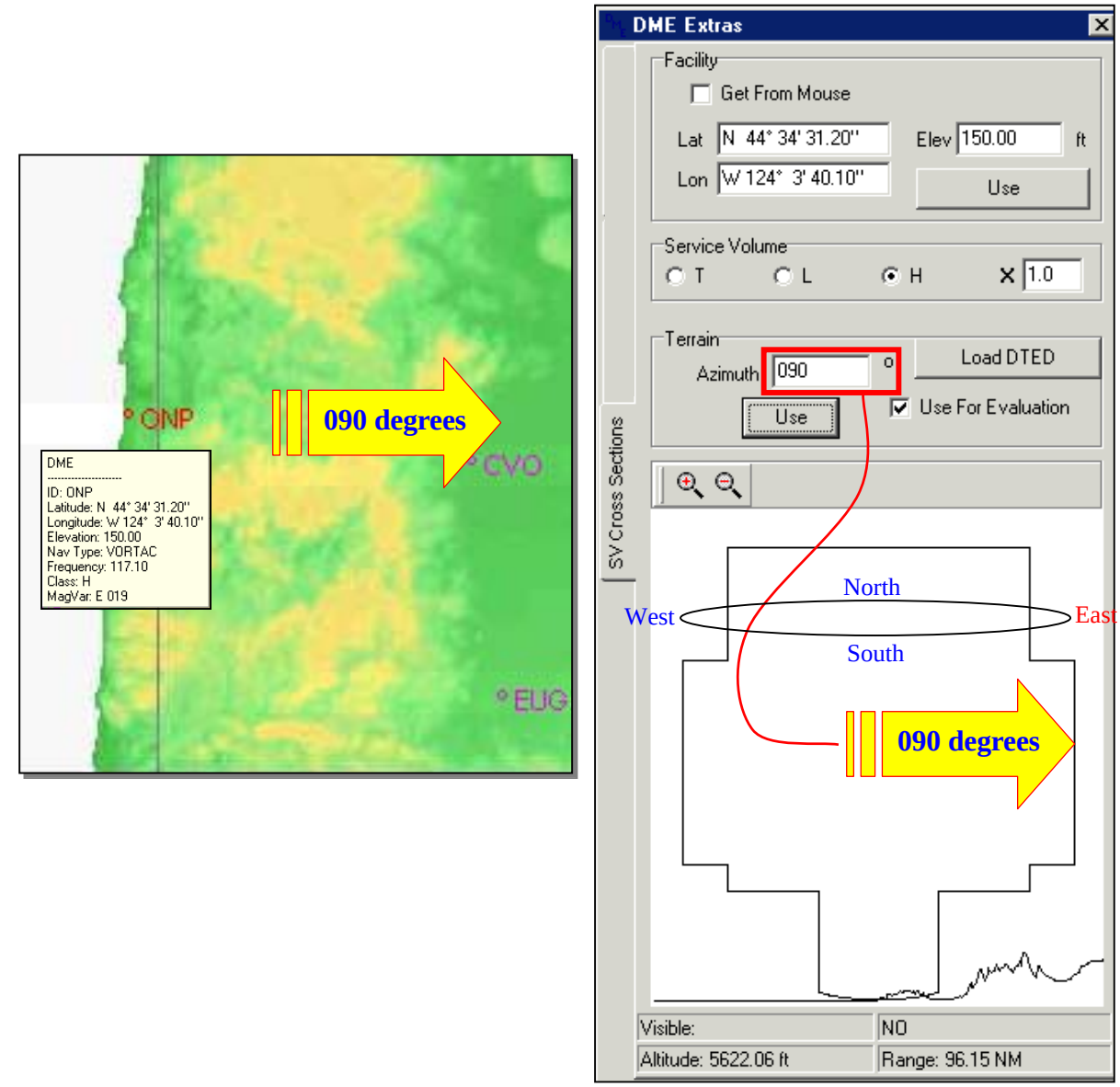


Figure 2-41: SV Cross Section Tab

2.6.6 TERPS Module

This module utilizes flight plan information that the user selected via the Current Database Tab or the Route Wizard for initial TERPS Criteria Screening. RNAV-Pro screens for FMS departure, RNAV departure, RNAV approach, RNP approach, LPV approach, RNAV en route, engine out surface and generic type three surfaces.

2.6.6.1 Global Settings Tab

This tab selects flight plans, database options, and runways for the TERPS evaluation.

Select Flight Plan: When more than one flight plans has been loaded, this drop-down menu allows the user to select which flight plan to use.

Screening Database Options: User selects choice of databases for screening.

- **Obstacles (DB):** National database.
- **Obstacles (User):** User input database.
- **Terrain:** DTED.

Selected Runways: Displays selected runway for departure or approach. Selection is made in the Search Data Module.

- **Departure:** Displays which airport/runway was selected in Search Data Module.

- **Approach:** Displays which airport/runway was selected in Search Data Module.

- **TCH:** Allows the user to input Threshold Crossing Height (TCH) in feet. The default setting is 50 feet.

Clear Surfaces: Clears TERPS surfaces and obstacles from the display.

Show Surfaces: Draws the primary and secondary TERPS surfaces in the Graphic Display.

Show Surface Alt: Displays the TERPS surface altitude and the altitude of terrain when the user positions the mouse over the TERPS surface.

- **Surface MSL:** Provides MSL altitude of the TERPs surface.
- **Surface AGL:** Provides AGL altitude of the TERPs surface.
- **DTED Lvl 1:** Shows elevation of terrain in MSL. The accuracy level is 4E.

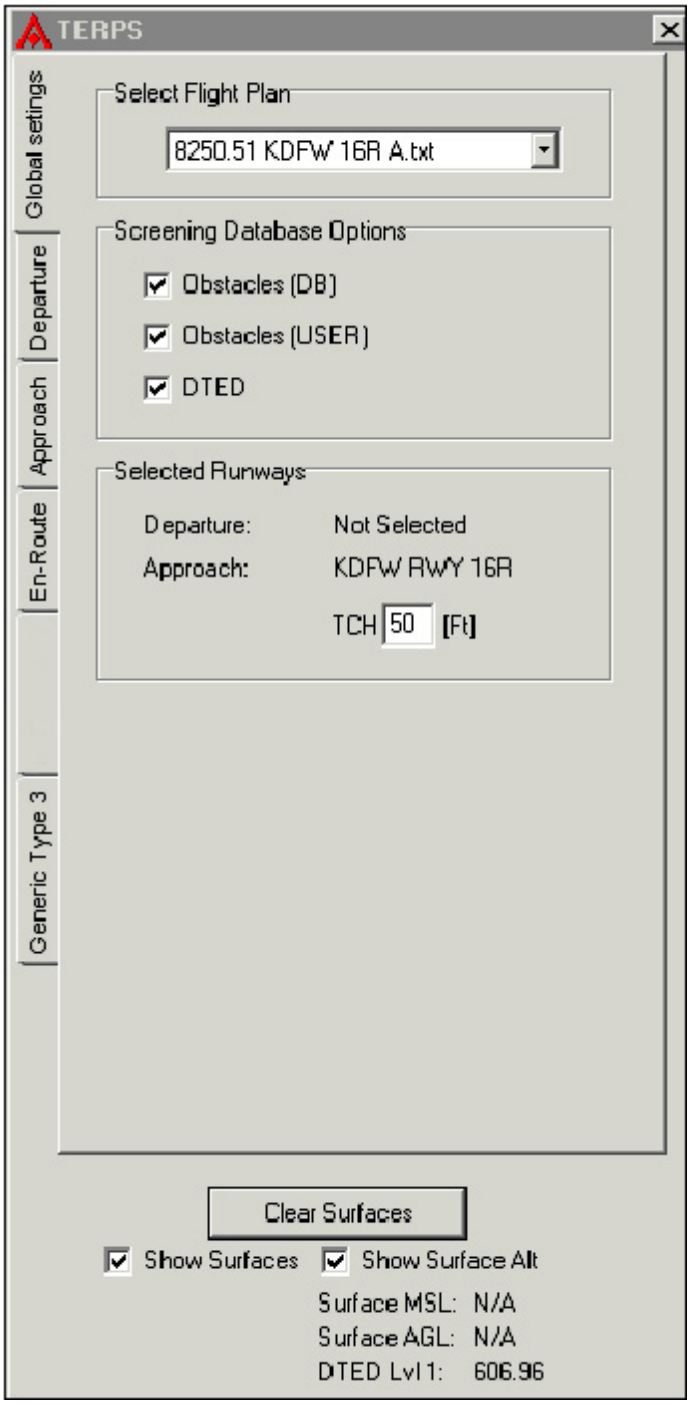


Figure 2-42: Global Setting Tab

2.6.6.2 Departure Tab

This tab allows user to generate and evaluate the following TERPs departure surfaces:

- **8260.40B FMS Departure.**
- **8260.44A RNAV Departure.**
- **8260.3 Volume 4 Departure.**

    - **Generate Surfaces:** Generates the TERPS surfaces. The TERPS surfaces must be generated on the Graphic Display prior to selecting.

    - **Evaluate Departure:** Evaluates the TERPS surfaces for penetrations. Terrain or man-made obstacles that penetrate the TERPS surface appear red; man-made obstacles that do not penetrate the TERPS surface appear green. The controlling (critical) obstacle is circled on the display to make it easily identifiable.

- **Mountainous Area:** Allows evaluation to be conducted using mountainous required obstacle clearance (ROC).
- **DER crossing height:** Allows user to set crossing height at Departure End of Runway.
- **ICA Length:** Allows user to set the length of the Initial Climb Area.

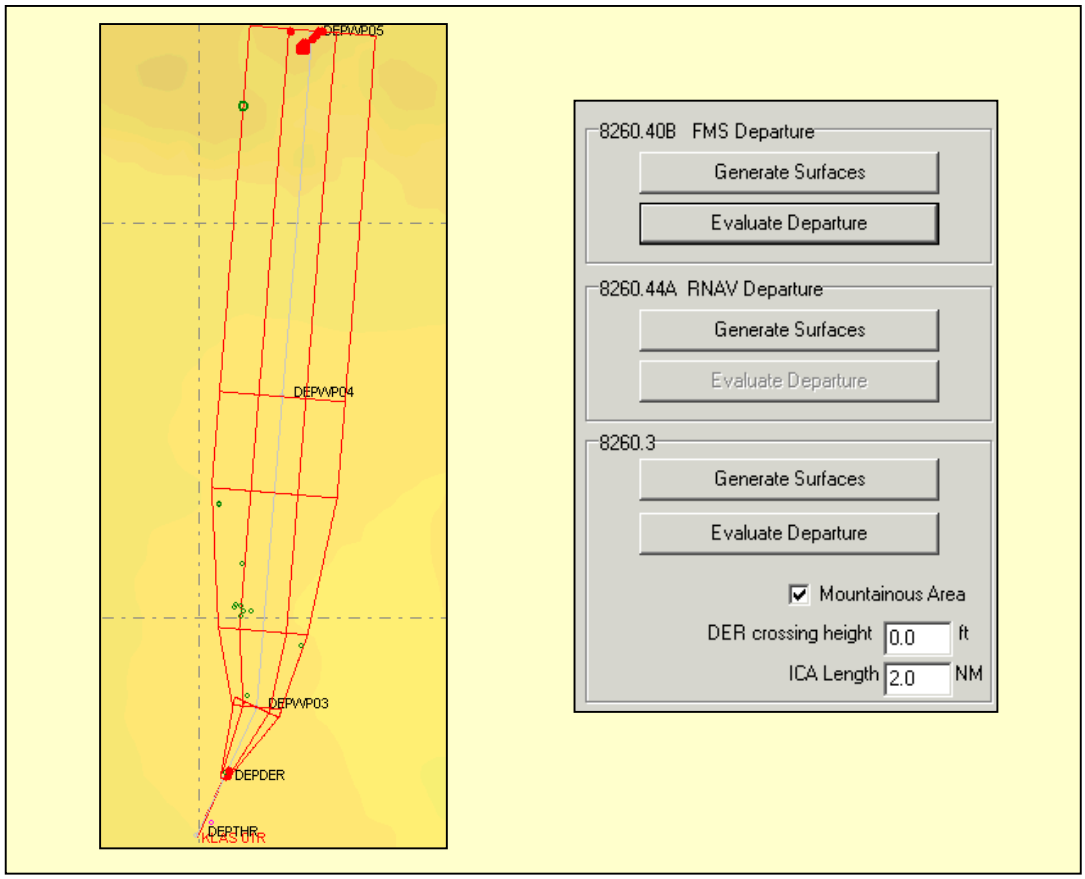


Figure 2-43: Departure Tab

2.6.6.3 Approach Tab

This tab allows user to select 8260.48 RNAV Approach criteria, 8260.50 WAAS LPV Approach criteria, or 8260.51 RNP Approach criteria for the evaluation.

- **Generate Surfaces** Generates the TERPS surfaces. The TERPS surfaces must be generated on the Graphic Display prior to selecting **"Evaluate Approach."**

- **Evaluate Approach:** Evaluates the TERPS surfaces for man-made obstacle and terrain penetrations.

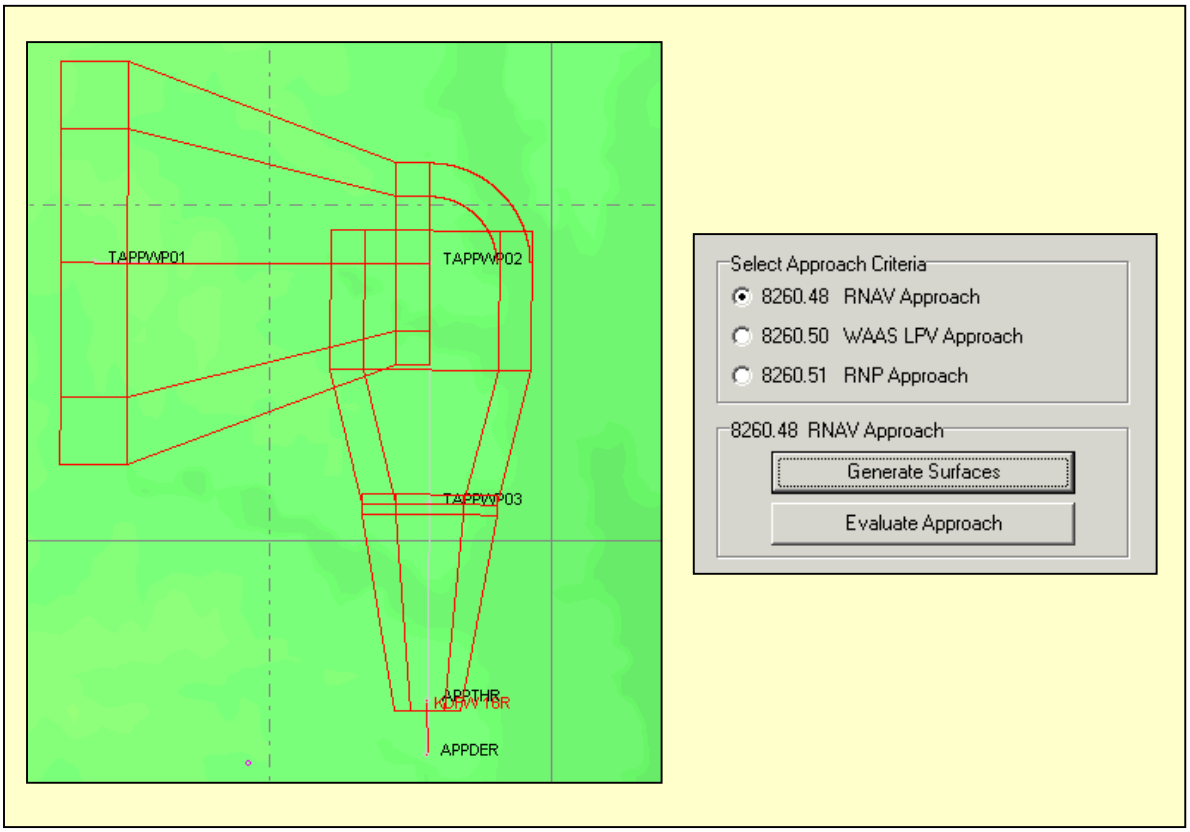


Figure 2-44 Approach Tab

2.6.6.4 En-Route Tab

This tab allows user to select 8260.3 Chapter 15 RNAV En-route criteria for the evaluation.

- **Generate Surfaces:** Generates the TERPS surfaces. The TERPS surfaces must be generated on the Graphic Display prior to selecting **Evaluate En-Route.**

- **Evaluate En-Route:** Evaluates the TERPS surfaces for man-made obstacle and terrain penetrations.

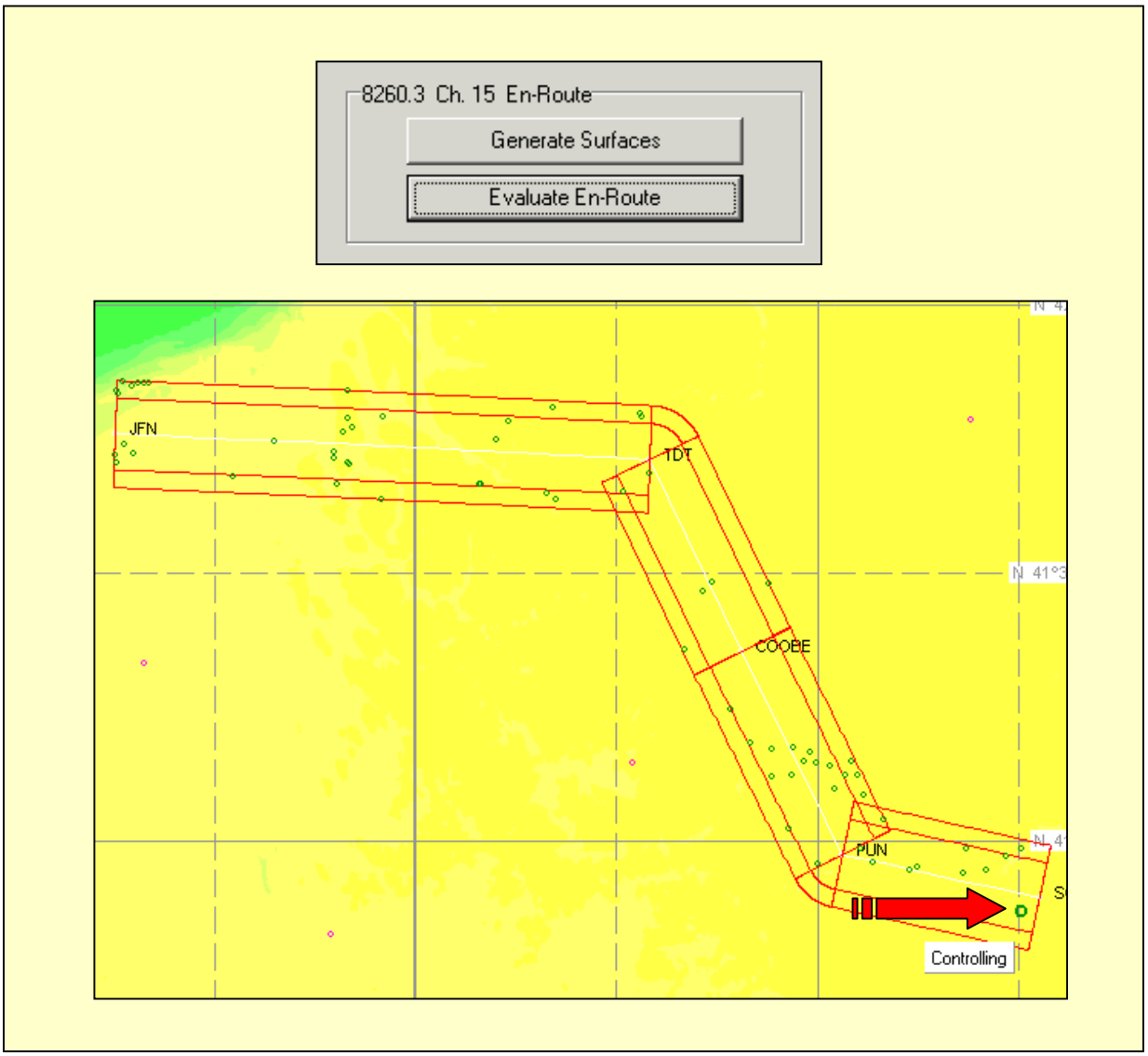


Figure 2-45 En-Route Tab

2.6.6.5 Engine-Out Tab

This tab allows user to generate and evaluate engine-out surfaces. The user must first build and load a departure flight plan before evaluating the engine out surface.

- **Criteria:** The user may select FAA or ICAO engine-out surfaces.
- **Date Certified:** The drop-down menu allows selection of one of three certification dates.
- **Total Engines:** Allows user to evaluate 2, 3, or 4 engine aircraft.
- **Maximum Altitude:** Engine-out criteria is normally evaluated up to an altitude of 1500 feet.
- **Generate Departure:** Generates the departure surface. The surface must be generated on the Graphic Display prior to selecting **"Evaluate Departures."**
- **Evaluate Departures:** Evaluates the departure surface for man-made obstacle and terrain penetrations.

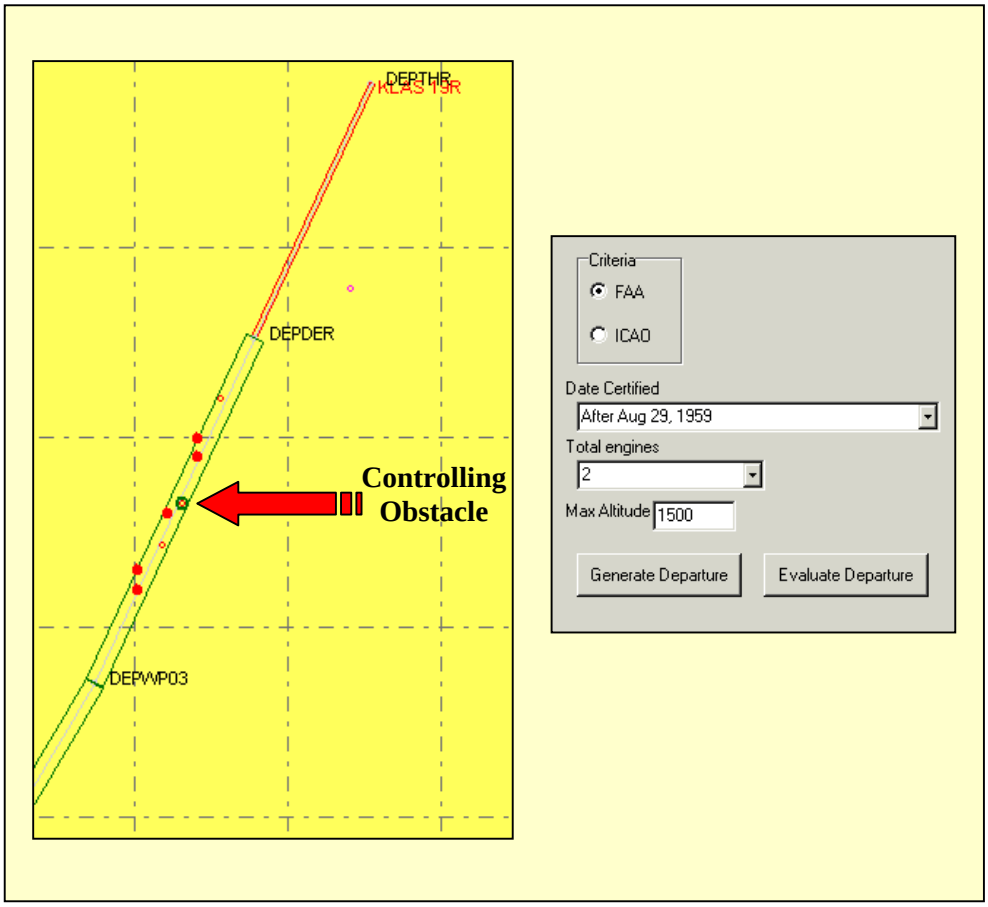


Figure 2-46 Engine-Out Tab

RNAV-Pro Alert and Tool Tip Boxes

- **RNAV-Pro Alert:** If TERPS flight track is loaded and the user selects Generate Surface, an RNAV-Pro Alert box advises the user "Criteria not met." More details will define TERPS Order and required criteria.

- **Obstacle ToolTip Box:** Positioning the mouse over a man-made obstacle in the Graphic Display generates a pop-up ToolTip box that identifies:

    - **Obstacle ID:** Alphanumeric obstacle identification.

    - **Latitude:** Latitude of the obstacle.

    - **Longitude:** Longitude of the obstacle.

    - **Type (of Obstacle):** Building, tower, terrain, tree, etc.

    - **Elevation (of Obstacle):** Altitude of the obstacle in feet.

    - **Clearance or Penetration:** The clearance height between the obstacle and the TERPS surface or the number of feet in which the obstacle penetrates into the TERPS surface. The clearance/penetration is only displayed if an evaluation of the TERPS area has been requested.

- **Terrain ToolTip:** Positioning the mouse over a terrain penetration in the Graph Display generates a pop-up ToolTip box that identifies:

    - **Terrain:** Identifies obstacle as terrain.

    - **Latitude:** Latitude of the terrain.

    - **Longitude:** Longitude of the terrain.

    - **Elevation:** Elevation of the terrain penetrating the TERPS surface in feet.

    - **Penetration:** The number of feet in which the terrain penetrates into the TERPS surface.

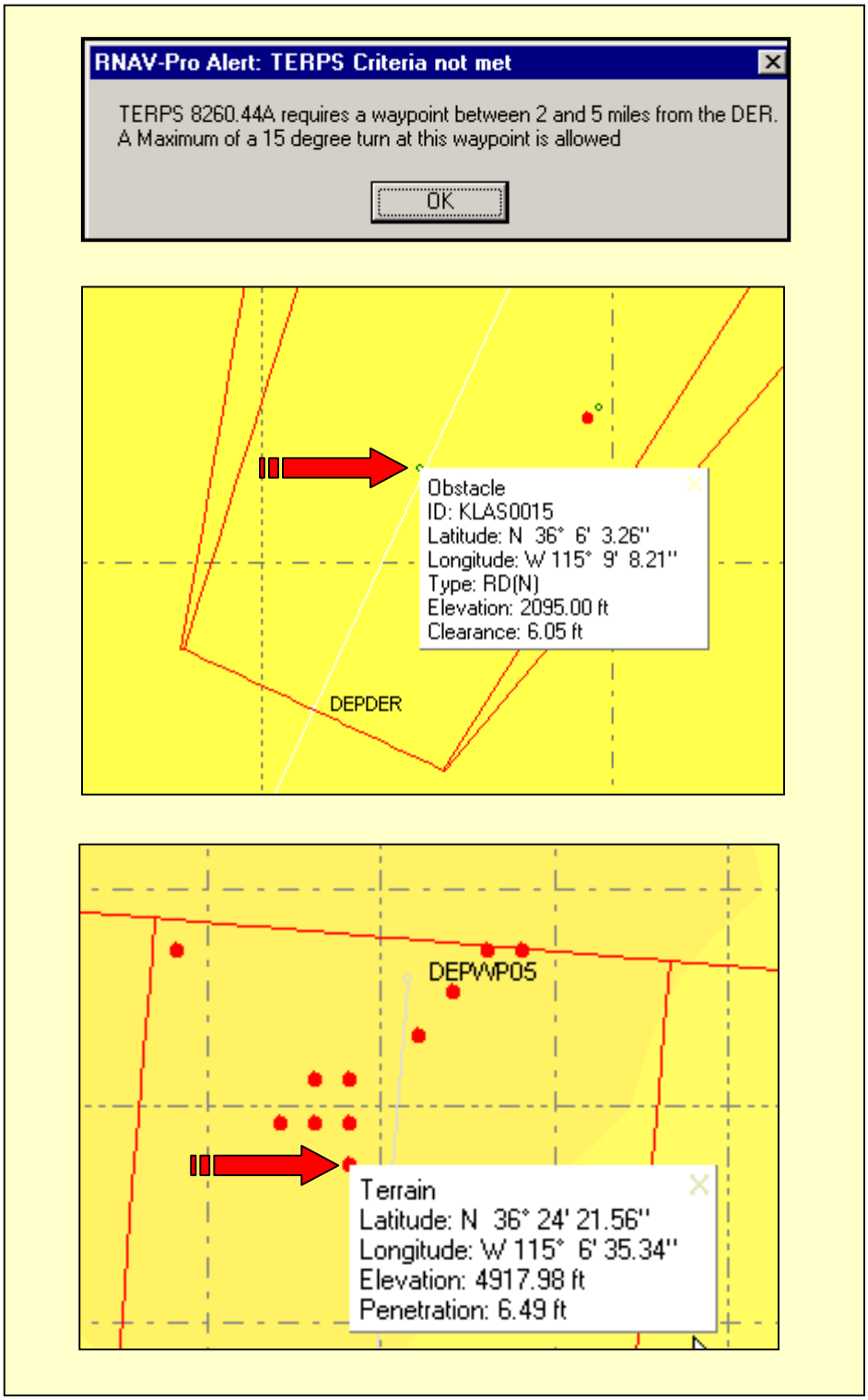
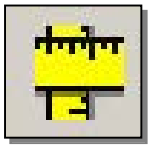


Figure 2-47 TERPS RNAV-Pro Alert and Obstacle/Terrain ToolTip Boxes



2.6.7 User Data Module

This module allows the user to add DME, radar, radio facilities, and man-made obstacles.

- **File:** This drop-down menu allows the user to load, save, or clear data.
- **DME, Radar, Radio, Obstacle:** Allow the user to select the type of data to be added or modified.
- **Add, Edit, Delete, and Clear All:** Allow the user to create, edit, delete, and clear data from the user database.
- **Add:** Opens a dialog box that allows the user to add data.
    - **Select Item with Mouse:** Selects an existing DME facility on the Graphic Display.
    - **Get Location with Mouse:** Allows the user to chooses location to place DME facility.
    - **Assign Restrictions:** Allows the user to place a restriction on the DME facility.
    - **Assign ESV:** Allows the user to assign an ESV to the DME facility.
    - **Elevation:** Allows the user to assign the elevation.
    - **SV:** Allows the user to selects choice of terminal, low, or high DME facility.
    - **Accept:** Accepts entered data.
    - **Cancel:** Cancels entered data.
    - **Use Instead of Existing DME:** Uses the facility's new location in the database.]
    - **Enable:** Enables or disables the DME facility**.**
- **Edit:** Opens an Edit dialog box and allows the user to edit data.
- **Delete/Clear All:** Allow user the to delete or clear data from the user database and Graphic Display.

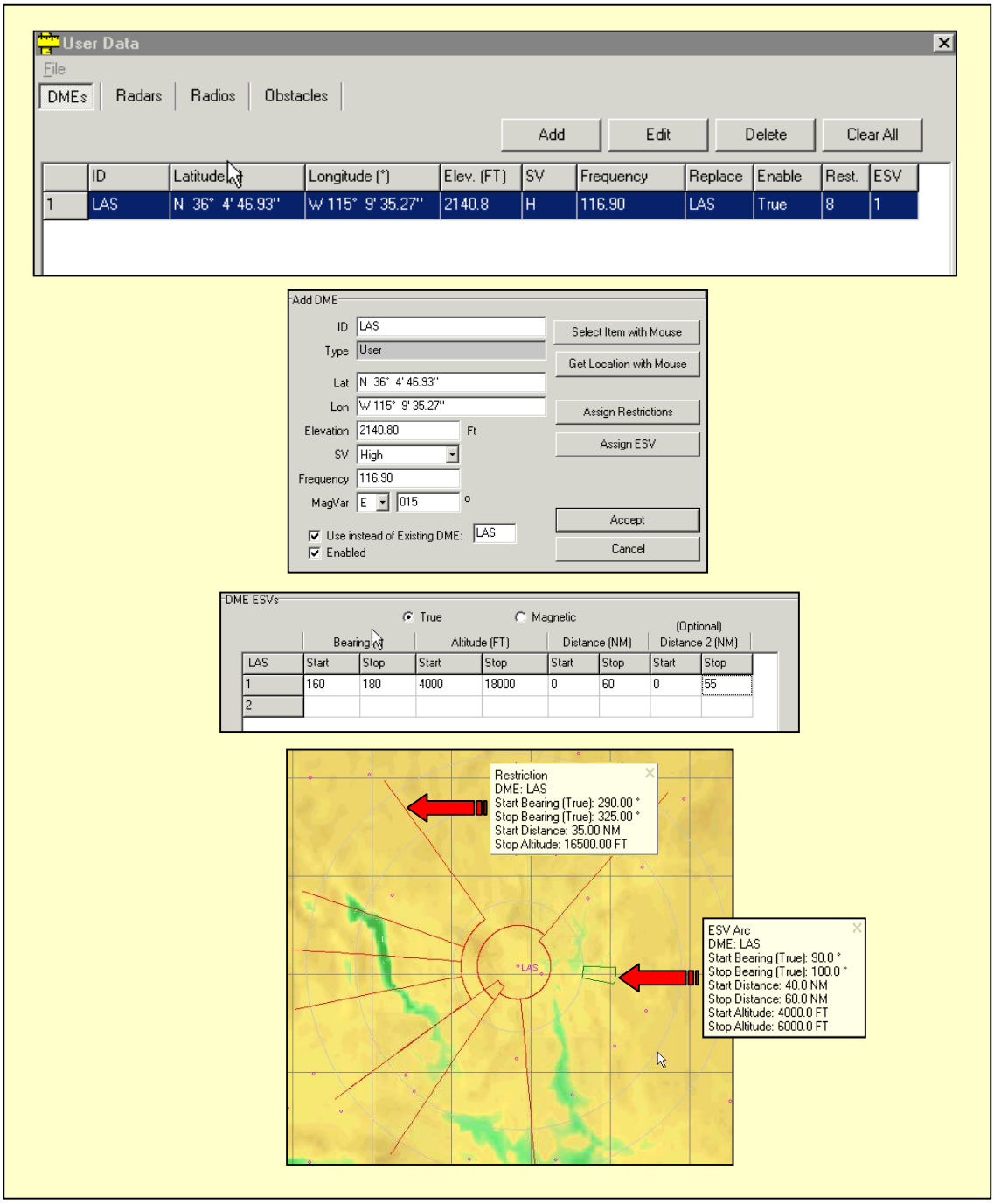


Figure 2-48: Assign ESV to DME Facility

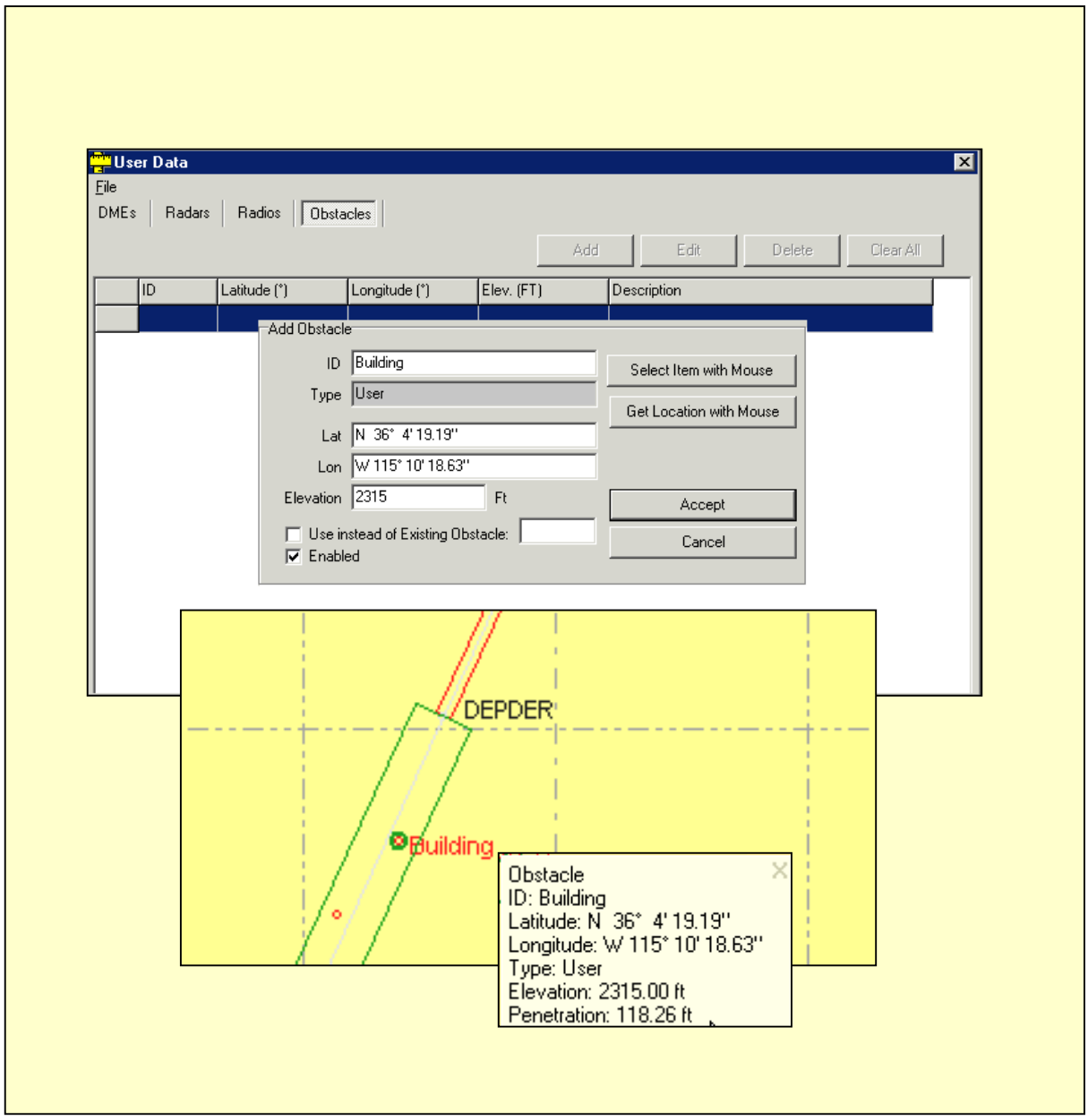


Figure 2-49: Add Obstacle

3.0 Conducting Screening (Via a Flight Plan Data Input File)

RNAV-Pro requires the user to provide a flight plan via a **Flight Plan Data Input File (FPDIF)** when conducting Flyability, DME, Radar, Communications, or TERPS Screening.

The user must load a **route** (i.e., FPDIF) and activate the flight plan via the **Run** button to perform:

- Flyability Screening
- DME Screening
- Radar Screening
- Communications Screening
- TERPS Screening

The user must load a **route** (i.e., FPDIF) and **select** an airport **runway** via the Flight Plan Wizard or the Search Data Module prior to generating and evaluating the TERPS surface to perform:

3.1 Creating an FPDIF

FPDIFs used by RNAV-Pro are tab-delimited text files. Users have ways to obtaining an FPDIF prior to conducting RNAV-Pro screening:

- Use an FPDIF that has already been created.
- Create an FPDIF via manual input of a 14-column, tab-delimited text file.
- Create an FPDIF using the RNAVPro Flight Plan Wizard.

This chapter describes how to create (and edit) an FPDIF and how to run (i.e., activate) the flight plan track following its creation.

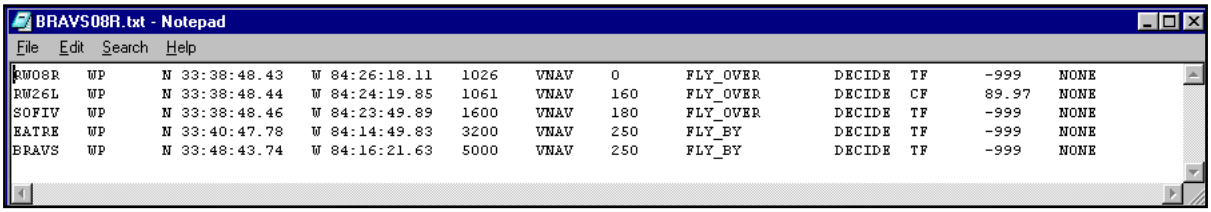


Figure 3-1: FPDIF Example

3.1.1 Creating an FPDIF Manually

RNAVPro is designed to execute an **FPDIF** defined by the user. The **FPDIF** is stored in a text file (see Table 3-1). Fields in the file should be tab-delimited (i.e., separated by tabs) with a carriage return entered following each line (including the final entry).

Table 3-1: FPDIF Example

Column #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	THR	WP	N	36:04:31.20	W	115:10:13.29	2200	VNAV	0	FLY_OVER	DECIDE	TF	-999	NONE
	DER	WP	N	36:05:58.76	W	115:09:23.18	2235	VNAV	160	FLY_OVER	DECIDE	CF	261.40	NONE
	WP3	WP	N	36:06:53.45	W	115:08:51.98	3100	VNAV	220	FLY_OVER	DECIDE	TF	-999	NONE
	WP4	WP	N	36:06:17.66	W	115:28:18.11	4000	VNAV	250	FLY_BY	DECIDE	TF	-999	NONE
	WP5	WP	N	36:35:14.07	W	115:32:09.49	6000	VNAV	250	FLY_BY	DECIDE	TF	-999	NONE
	WP6	WP	N	36:31:49.14	W	115:26:08.73	7000	VNAV	250	FLY_OVER	DECIDE	TF	-999	NONE

Table 3-2: FPDIF Field Descriptions

Col. #	Description	Units	Comments
1	WP Name	N/A	The name displayed when selecting “Show WP Names” in the Display Tab.
2	WP (placeholder)	WP, IF, VM	Standard WP - **WP**, Initial Fix - **IF**, Manual Termination - **VM**
3	N/S Hemisphere	N/A	Options: **N** - North, **S** - South.
4	WP Latitude	Deg:Min:Sec.hSec	Latitude degrees must be designated using 2 digits (e.g., 38:12:34.32).
5	E/W Hemisphere	N/A	Options: **E** - East, **W** - West.
6	WP Longitude	Deg:Min:Sec.hSec	Longitude degrees must be designated using 3 digits (e.g., 098:12:34.32, not 98:12:34.32).
7	WP Altitude	Feet	Example: FL240 would be entered as 24000.
8	VNAV Logic	N/A	Method aircraft used to arrive at this WP. Options: **STEP** - Will STEP to altitude. **VNAV** - Will VNAV to altitude.
9	IAS	Knots	Required Indicated Airspeed at WP.
10	WP Type	N/A	Options: **FLY_BY** or **FLY_OVER**.
11	Turn Direction Switch	N/A	Direction aircraft must turn at this WP to get to the next WP. Options: **LEFT** - Force a left turn at the WP. **RIGHT** - Force a right turn at the WP. **DECIDE** -- The FMS will select a turn direction that will result in the shorter turn. **NONE** - Do not turn.
12	RNAV Leg Type	N/A	From this WP, use this leg type to arrive at the next WP. Options: **CA** - Course to an altitude. **CF** - Course to a fix. **DF** - Direct to a fix. **TF** - Track to a fix. **VA** - Heading to an altitude. **FA** - Fix to an altitude.
13	Course to a Fix Value	Degrees.hDegrees*	If a CF leg is selected, the CF course MUST be given. Enter –999 for other leg types.
14	Segment	N/A	Options: **INITIAL, INTER, FINAL, NONE.**

* Hundredth of a second

3.1.2 Creating an FPDIF Using the Wizard

The **Flight Plan Wizard** is a user-friendly method of creating an **FPDIF**.

On the Main Display Window, click on the **Route** drop-down menu and select **"Wizard"** or click the "**Wizard"** square button.

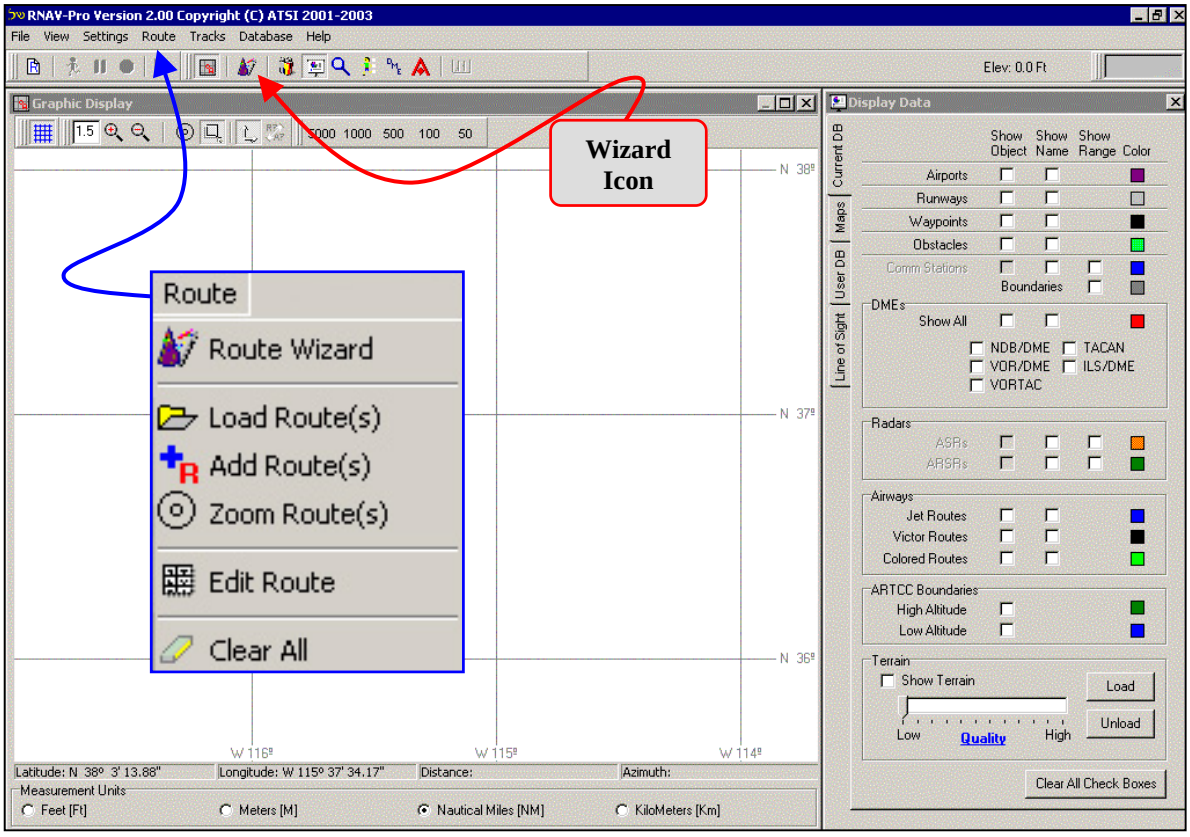
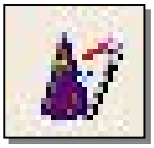


Figure 3-2: Create an FPDIF Using the Flight Plan Wizard



3.1.2.1 Flight Plan Wizard

When the **Flight Plan Wizard** Module appears, select the appropriate checkbox(es) for the segments (i.e., Departure, Route, and/or Approach) that are to be included in the flight plan; then, click **"Next."**

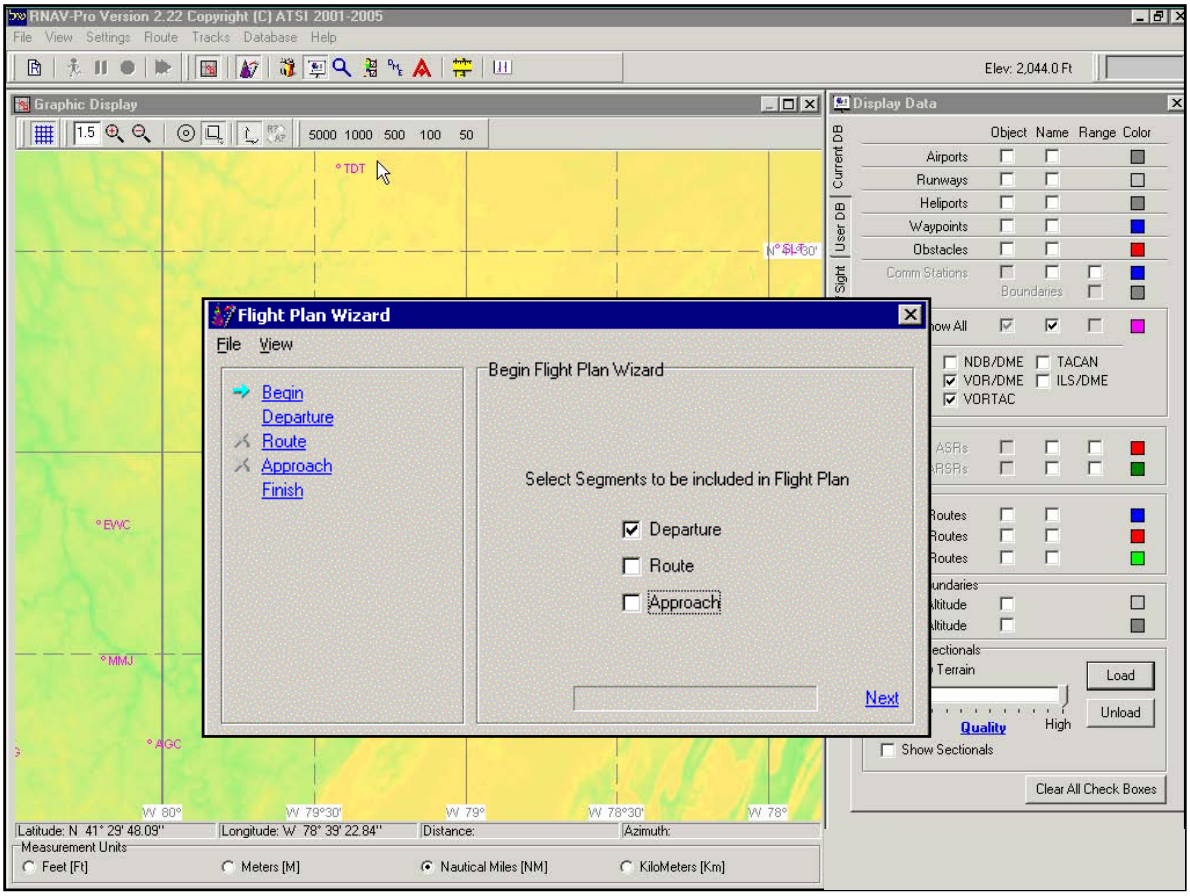


Figure 3-3: Select Departure Segment

3.1.2.2. Select Departure Runway

This area appears in the Flight Plan Wizard Module. Using the Airport drop-down menu, select the desired airport four-character designation and press the Enter key. Pressing Enter or clicking **"Zoom"** will zoom to the selected airport location on the Graphic Display. Using the Runway drop-down menu, select the runway desired. In the Initial Climb Altitude entry field, enter the desired initial climb altitude and press the Enter key. Select **"Next."**

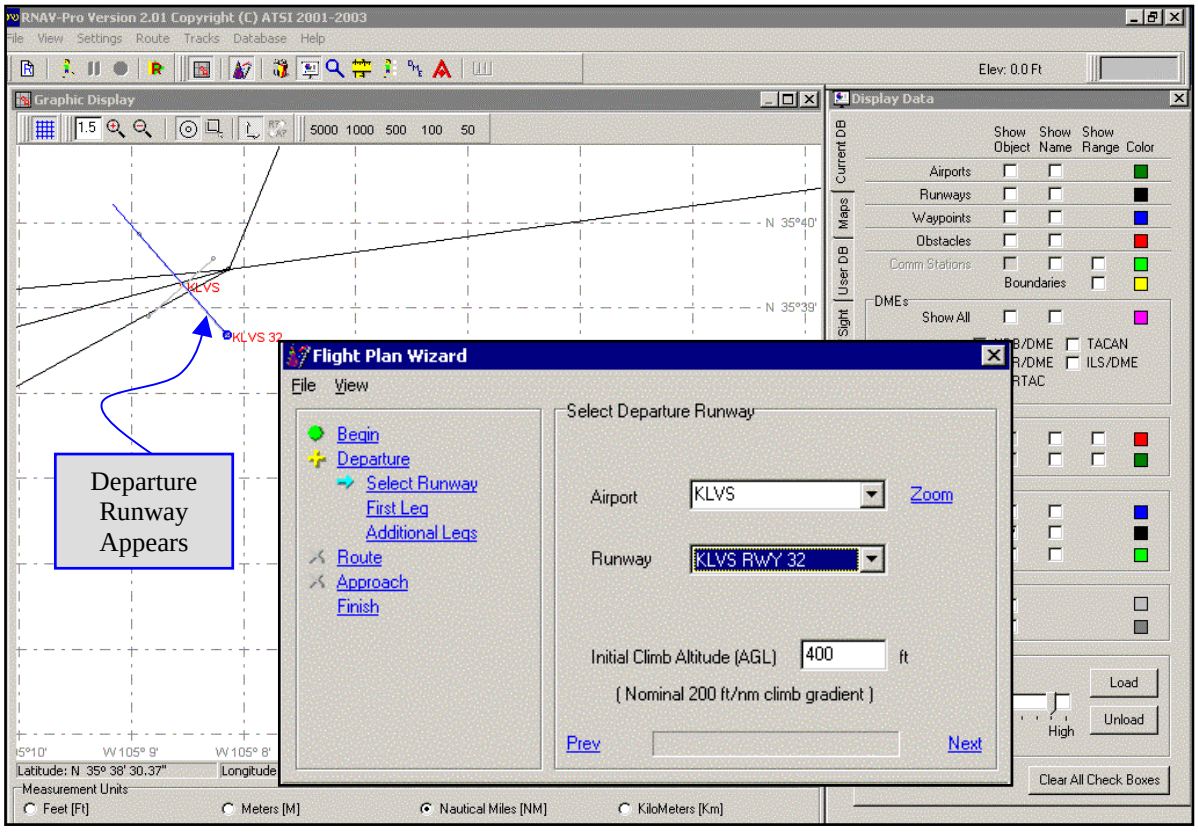


Figure 3-4: Select Departure Runway

3.1.2.3 First Departure Leg

This area appears in the Flight Plan Wizard Module. Check the "**Get From Mouse**" box; then, click on the desired position of the first departure leg on the Graphic Display. The latitude/longitude of the selected position appears in the Flight Plan Wizard Module. The waypoint name, latitude, longitude, and altitude can be modified if desired. When **"Next"** is selected, the waypoint is connected to the departure leg as shown in the following figure.

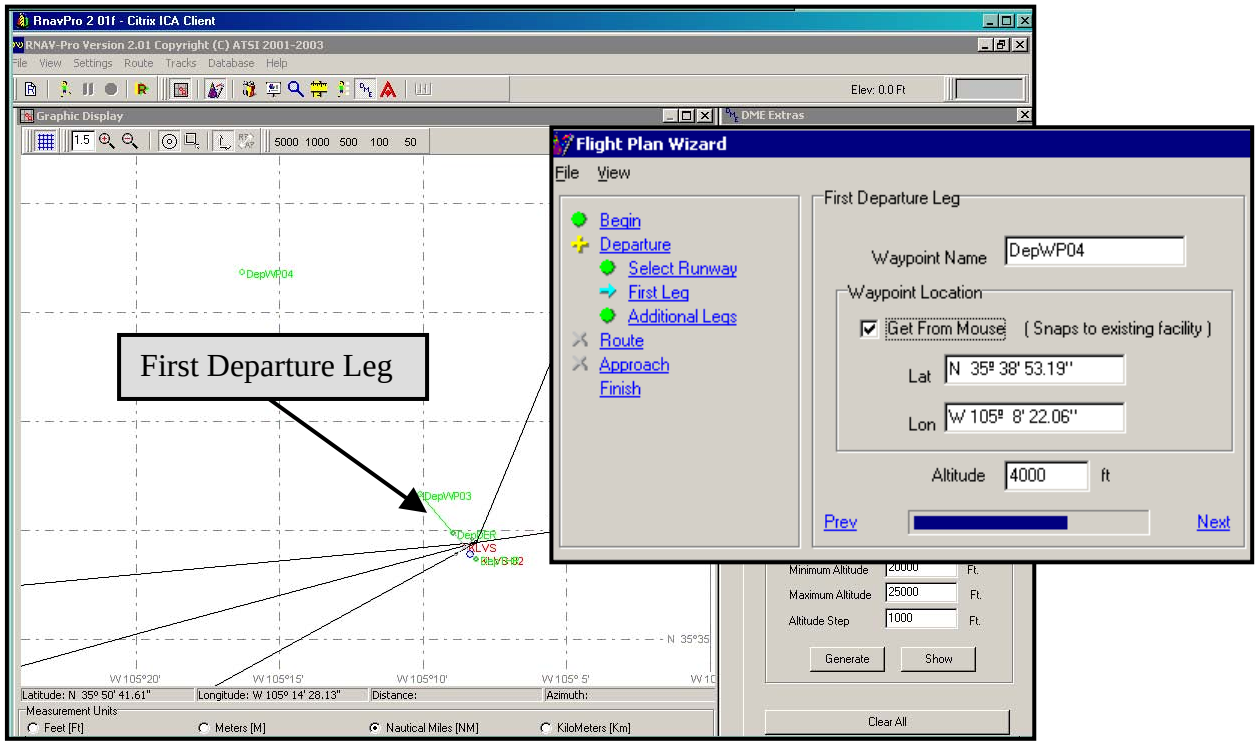


Figure 3-5: Select First Departure Leg

3.1.2.4 Advanced Options

The waypoint from the first departure leg is now connected to the departure runway. The Additional Departure Legs area appears. To access advanced options, click on the View drop-down menu and select **"Advanced."** An **Advanced Options** area appears in which waypoint bearing (with respect to true north) and distance from the previous waypoint can be manually selected. When finished, select **"Next."**

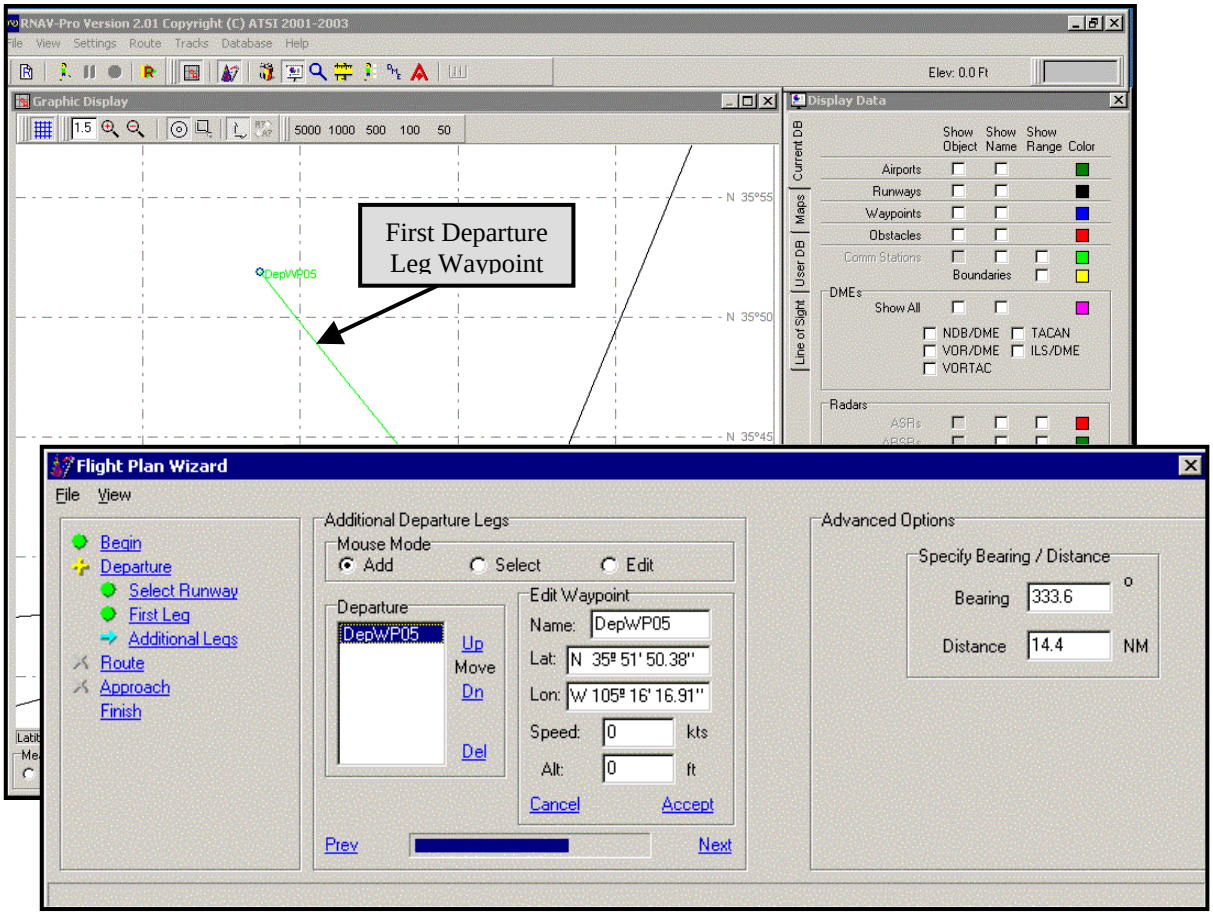


Figure 3-6: Advanced Options

3.1.2.5 Additional Departure Leg

The **Additional Departure Legs** area appears. Use the mouse to select any additional departure legs desired in the Graphic Display.

- **Mouse Mode Radial Buttons:** allow the user to add a new waypoint to the list, select a waypoint that has been drawn on the display, or edit a waypoint after selecting it on the display. Each mouse click adds additional waypoints to the Departure entry field.
- **Edit Waypoint:** Allows the user to set the name, latitude, longitude, speed, and altitude for each waypoint using their respective entry field.
- **Up and Dn (next to the Departure Entry field):** Allow the movement of selected waypoints up and down in the list of waypoints.

"Advanced" on the View drop-down menu provides advanced options, in which waypoint bearing and distance may be manually entered. When finished, select **"Next."**

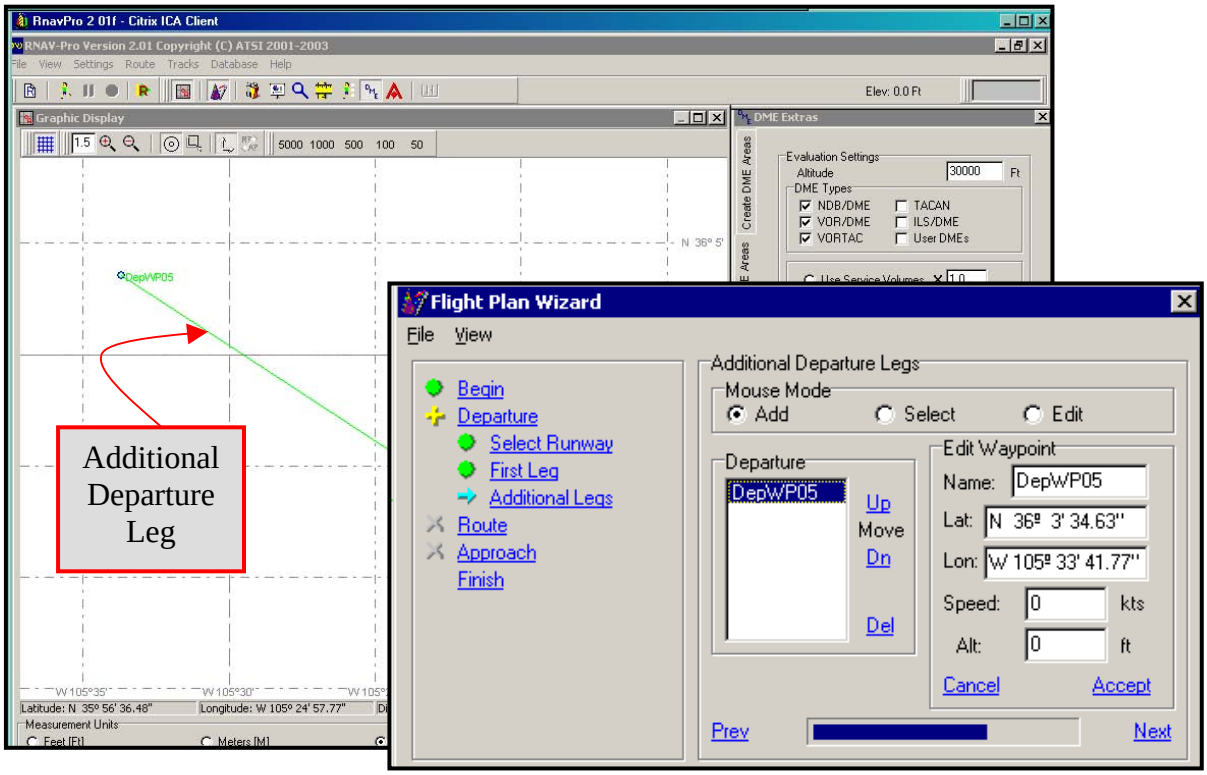


Figure 3-7: Select Additional Departure Legs

3.1.2.6 Finish Flight Plan

Upon completion of departure legs, the **Finish Flight Plan** area appears. Three options are included in the **Finish Flight Plan** area:

- **Generate Flight Plan:** Allows the user to name and save the route just created via the Wizard.

- **Close Wizard:** Allows the user to close the Flight Plan Wizard Module.

- **Reset Wizard:** Allows the user to reset the Wizard (i.e., clear Flight Plan Wizard box area entries, return to the Flight Plan Wizard Module "Begin Flight Plan Wizard" area, and clear from the graphic display the displayed route created via the Wizard).

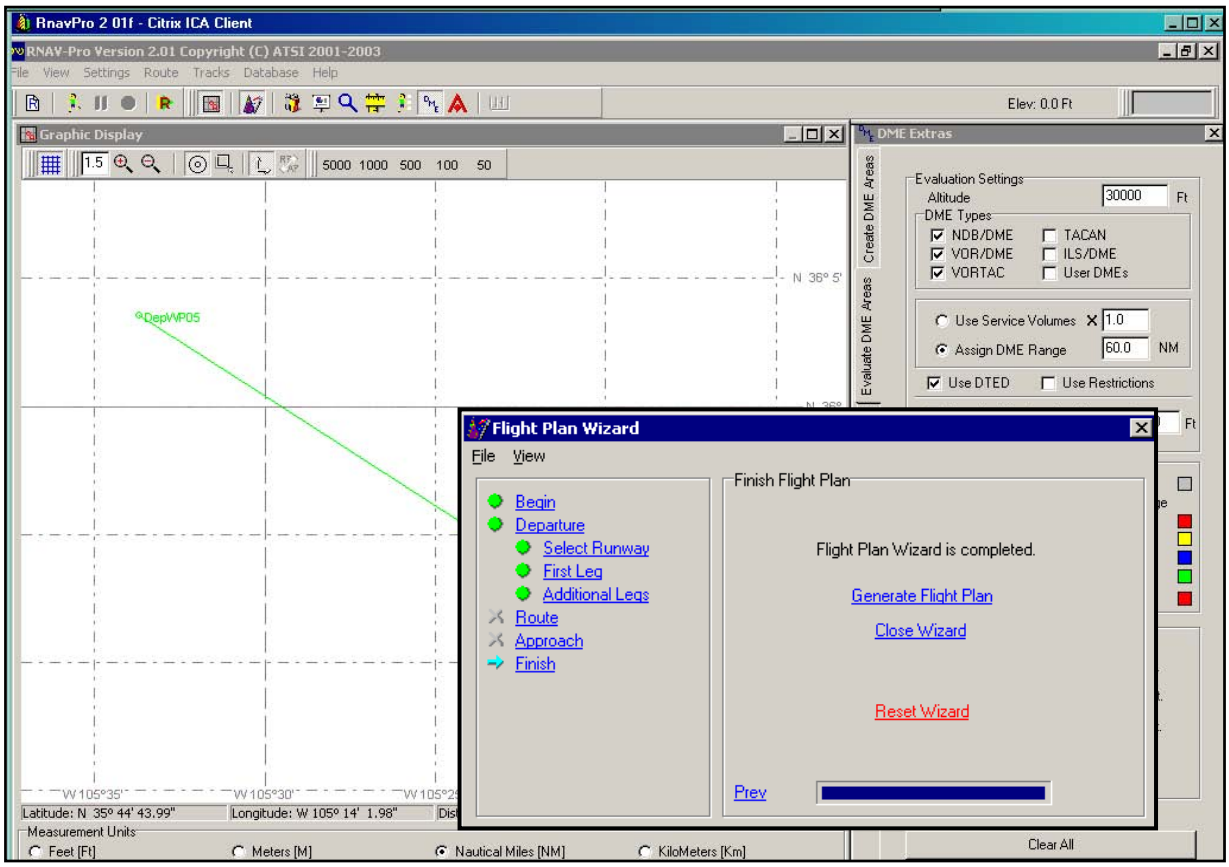
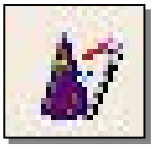


Figure 3-8: Finish Flight Plan

Note:	Route and Approach were not selected in this example. Therefore, the window proceeds from Departure directly to Finish.



3.1.2.7 Generate Flight Plan

- **Save As:** This box allows the user to select the location, name, and type file which has been created by the Wizard.

    - **Save in:** Select the subdirectory to save the flight plan.
    - **File name:** Enter the desired name of the flight plan.
    - **Save as type:** Enter the file type as a ".txt" extension.
    - **Save:** Saves the file.
    - **Cancel: .** Allows user to cancel the action.

- **Reset Wizard**: Select after saving the flight plan, the Flight Plan Wizard will be ready for a new flight plan.

- **Close Wizard:** Closes the Wizard without clearing any data from the Flight Plan Wizard.

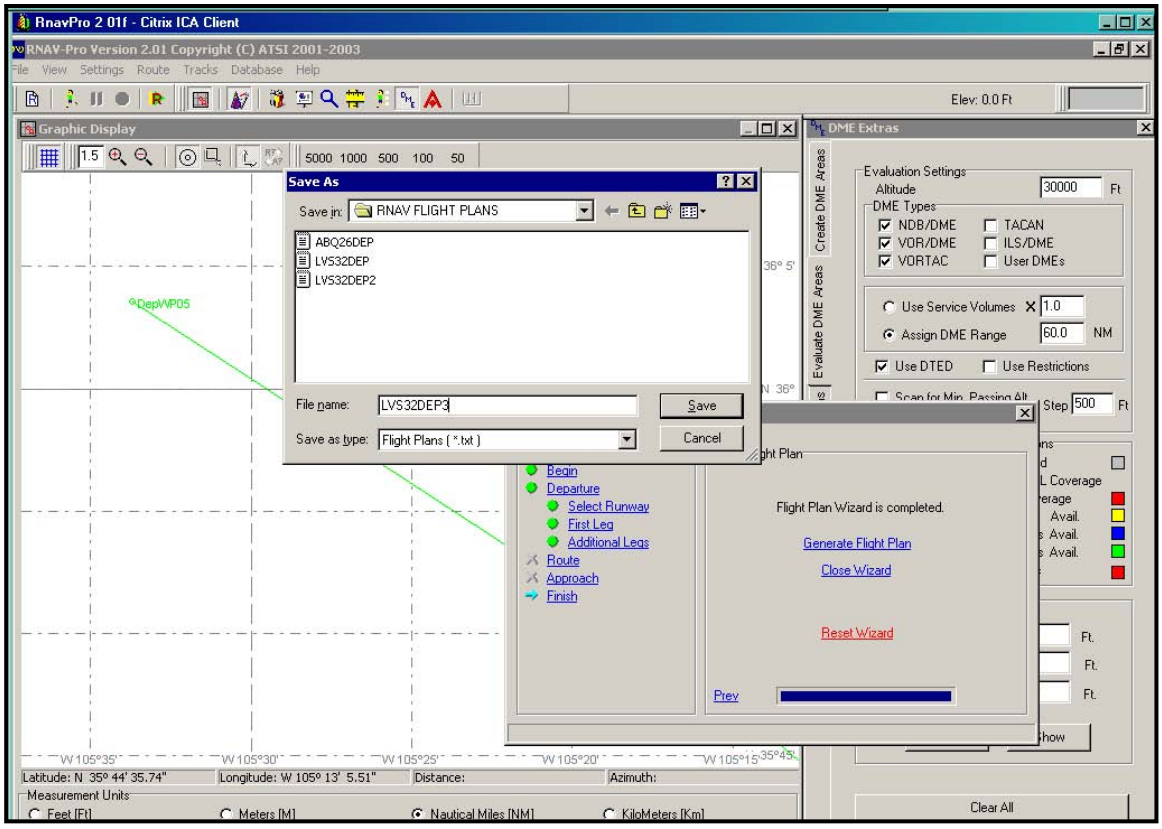


Figure 3-9: Generate Flight Plan

3.2 Editing an FPDIF

FPDIFs can be edited manually or via the Flight Plan Editor.

3.2.1 Editing an FPDIF Manually

The **FPDIF** is a text file (see Table 3-3). Manual modification of an FPDIF may be performed using any text editor (e.g., Notepad, WordPad). Fields in the file should be tab-delimited with a carriage return entered following each line (including the final entry).

Table 3-3: FPDIF Example

Column #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	THR	WP	N	36:04:31.20	W	115:10:13.29	2200	VNAV	0	FLY_OVER	DECIDE	TF	-999	NONE
	DER	WP	N	36:05:58.76	W	115:09:23.18	2235	VNAV	160	FLY_OVER	DECIDE	CF	261.40	NONE
	WP3	WP	N	36:06:53.45	W	115:08:51.98	3100	VNAV	220	FLY_OVER	DECIDE	TF	-999	NONE
	WP4	WP	N	36:06:17.66	W	115:28:18.11	4000	VNAV	250	FLY_BY	DECIDE	TF	-999	NONE
	WP5	WP	N	36:35:14.07	W	115:32:09.49	6000	VNAV	250	FLY_BY	DECIDE	TF	-999	NONE
	WP6	WP	N	36:31:49.14	W	115:26:08.73	7000	VNAV	250	FLY_OVER	DECIDE	TF	-999	NONE

Table 3-4: Flight Plan Data Input File Field Descriptions

Col. #	Description	Units	Comments
1	WP Name	N/A	The name displayed when selecting “Show WP Names” in the Display Tab.
2	WP (placeholder)	WP, IF, VM	Standard WP - **WP**, Initial Fix - **IF**, Manual Termination - **VM**
3	N/S Hemisphere	N/A	Options: **N** - North, **S** - South.
4	WP Latitude	Deg:Min:Sec.hSec*	Latitude degrees must be designated using 2 digits (e.g., 38:12:34.32).
5	E/W Hemisphere	N/A	Options: **E** - East, **W** - West.
6	WP Longitude	Deg:Min:Sec.hSec*	Longitude degrees must be designated using 3 digits (e.g., 098:12:34.32, not 98:12:34.32).
7	WP Altitude	Feet	Example: FL240 would be entered as 24000.
8	VNAV Logic	N/A	Method aircraft used to arrive at this WP. Options: **STEP** - Will STEP to altitude. **VNAV -** Will VNAV to altitude.
9	IAS	Knots	Required Indicated Airspeed at WP.
10	WP Type	N/A	Options: **FLY_BY** or **FLY_OVER**.
11	Turn Direction Switch	N/A	Direction aircraft must turn at this WP to get to the next WP. Options: **LEFT -** Force a left turn at the WP. **RIGHT -** Force a right turn at the WP. **DECIDE -** The FMS will select a turn direction that will result in the shorter turn. **NONE -** Do not turn.
12	RNAV Leg Type	N/A	From this WP, use this leg type to arrive at the next WP. Options: **CA -** Course to an altitude. **CF -** Course to a fix. **DF -** Direct to a fix. **TF -** Track to a fix. **VA -** Heading to an altitude. **FA -** Fix to an altitude.
13	Course to a Fix Value	Degrees.hDegrees*	If a CF leg is selected, the CF course MUST be given. Enter –999 for other leg types.
14	Segment	N/A	Options: **INITIAL, INTER, FINAL, NONE.**

* Hundredth of a second

3.2.2 Editing an FPDIF Using the Flight Plan Editor

The Flight Plan Editor (a.k.a., Route Editor or Editor) Module appears. The Flight Plan Editor is a user-friendly method of modifying FPDIFs, but it is typically more cumbersome than to simply edit FPDIFs manually as described in Section 3.2.1. Use the **"Route"** drop-down menu to open the Flight Plan editor, then select **"Edit Route".**

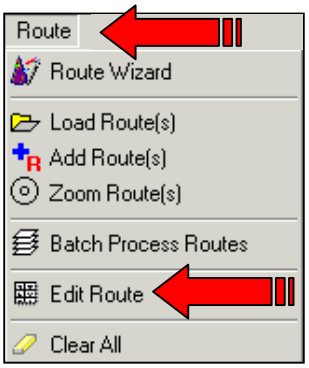


Figure 3-10: Opening Route Editor

- Use either the drop-down menu or square button to load a flight plan.

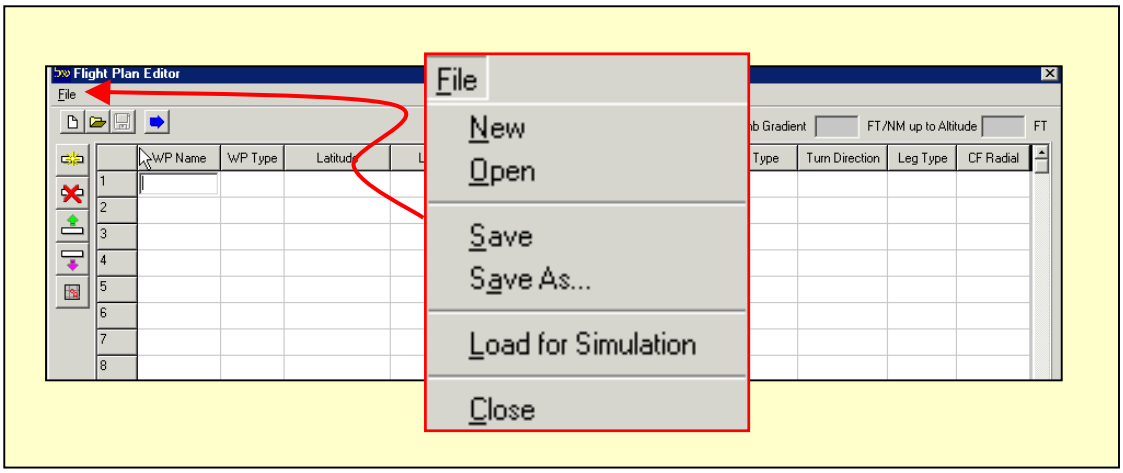


Figure 3-11: Load Flight Plan Using Drop-Down Menu

- The selected flight plan is now loaded into the Flight Plan Editor.

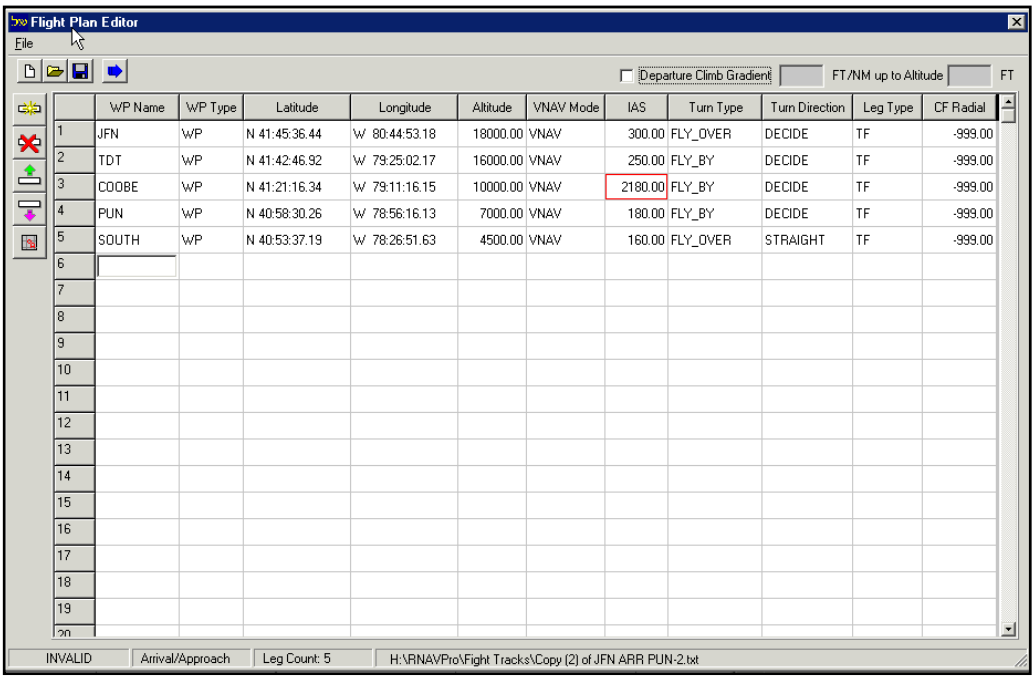


Figure 3-12: Flight Plan Editor

The Flight Plan Editor has nine Square Buttons; their functions are:

- **New:** Used to create a new flight plan on the editor.
- **Open:** Used to open an existing flight plan.
- **Save:** Used to save a flight plan. (This function is currently inactive.)
- **Load for Simulation:** Loads the flight plan on to the Graphic Display.
- **Insert Row:** Allows the user to insert a new row in the flight plan.
- **Delete Row:** Allows the user to delete a row.
- **Move Row Up:** Moves the selected row up.
- **Move Row Down:** Moves the selected row down.
- **Get Lat Lon From DrawSpac:** Allows the user to modify or add latitude and longitude coordinates using a mouse click in the Graphic Display.

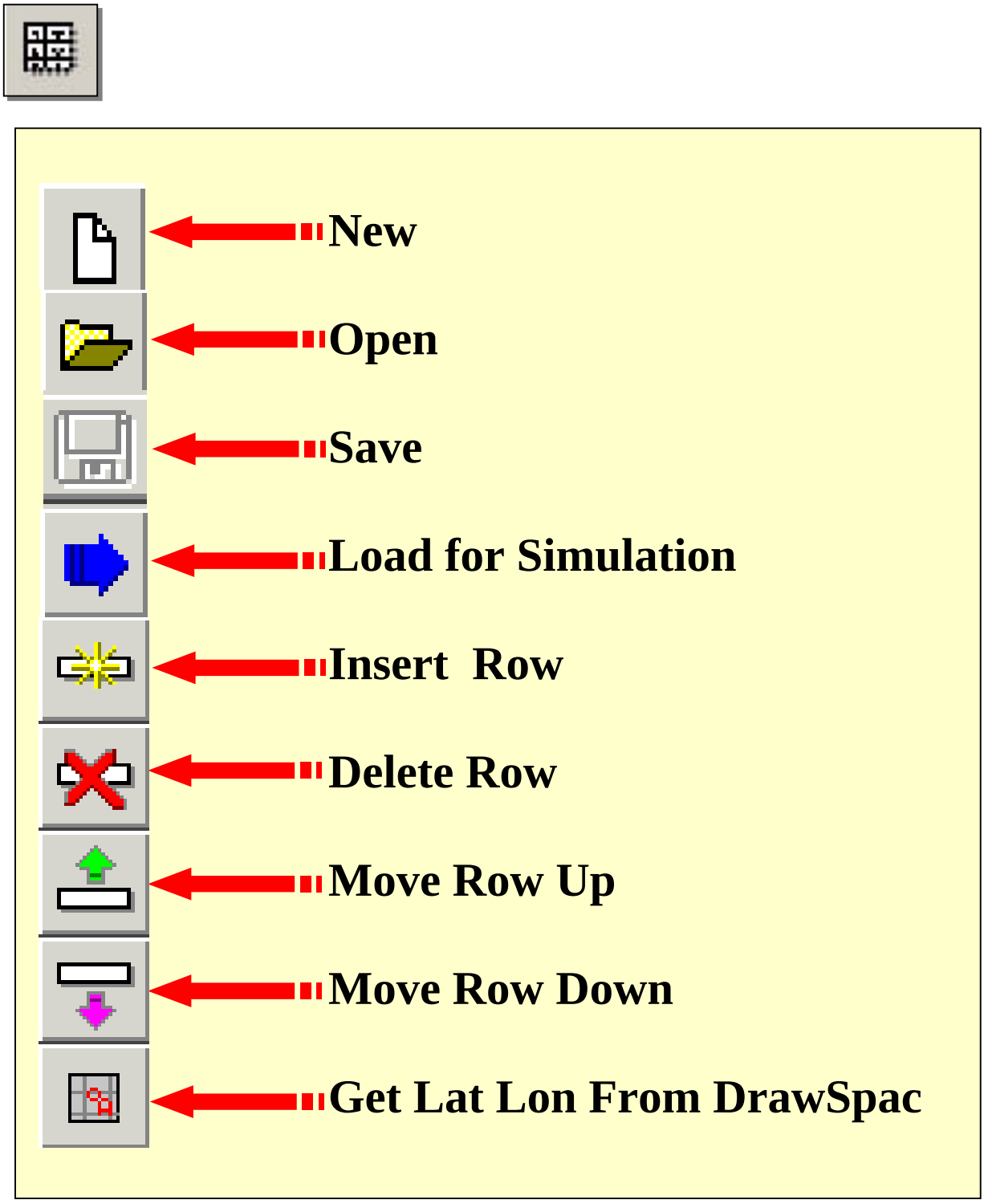


Figure 3-13: Flight Plan Editor Square Buttons

The user can select fields to modify within the FPDIF.

- Fields without drop-down menus (i.e., WP Name, Lat, Lon, Alt, VNAV Mode, IAS, Turn Type, Turn Direction, Leg Type, CF Radial) are modified by clicking on the item to be changed. The user may then type in the desired information and press Enter.

- Fields with drop-down menus (i.e., WP Type, VNAV Mode, Turn Type, Turn Direction, , Leg Type) are changed by selecting the desired information in a drop-down menu.

- Items highlighted in red **must** be modified.

- Items highlighted in blue **should** be modified.

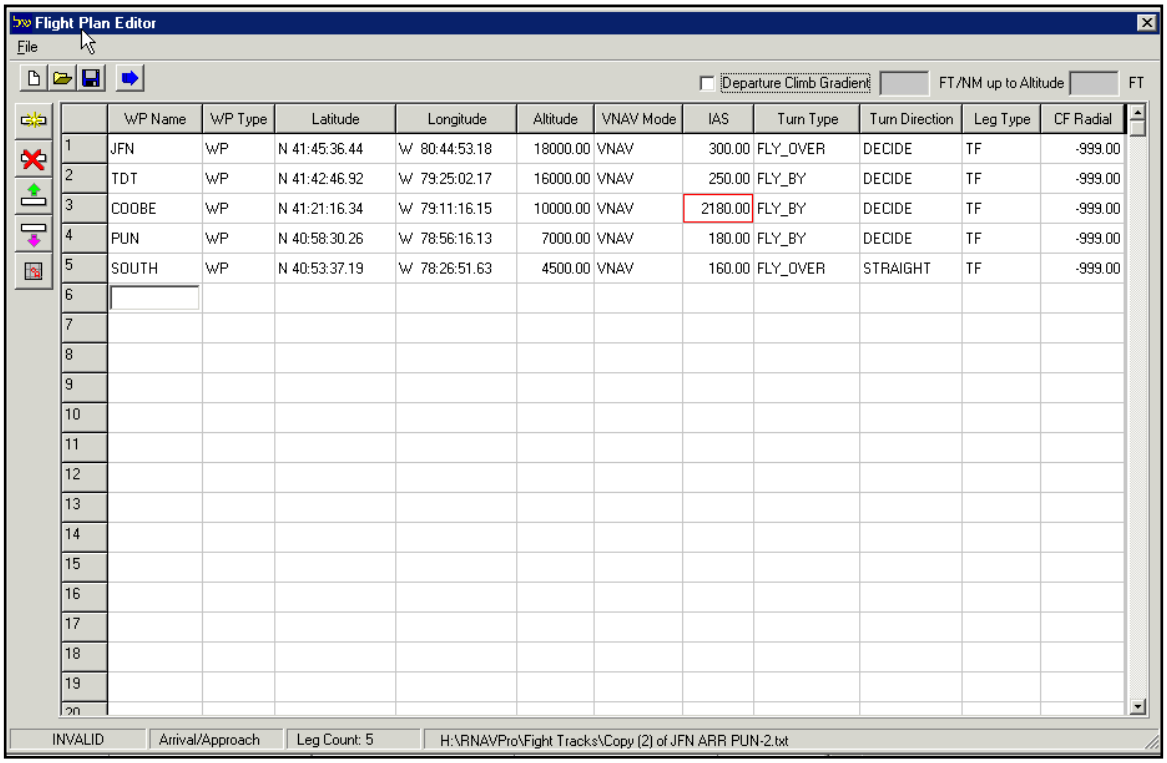
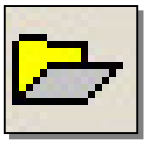


Figure 3-14: Flight Plan Editor Corrections



3.3 Using an FPDIF

Sections 3.3.1 – 3.3.3 provide specific details on using an FPDIF. This page provides a general summary of the detailed information to follow.

The user must **Load a Route** (i.e., FPDIF) prior to conducting:

- Flyability Screening
- DME Screening
- Radar Screening
- Communications Screening
- TERPS Screening

Following route loading, the user must:

- Activate the flight plan via the **Run** button to perform:
    - Flyability Screening
    - DME Screening
    - Radar Screening
    - Communications Screening
- The user must **Select** an airport **runway** via the Flight Plan Wizard or the Current Database tab prior to generating and evaluating the TERPS surface to perform:
    - TERPS Screening

3.3.1 Loading an FPDIF

To **load** and **run** (i.e., activate) a flight plan track:

- Click on the **Route** drop-down menu and select **"Load."**
    - The Open dialog box appears.
- In the **Look In** entry area, select a subdirectory.
- Select a text file (e.g., BRAVS08R.txt) from the dialog box. You may also type the file name into the File Name entry area.

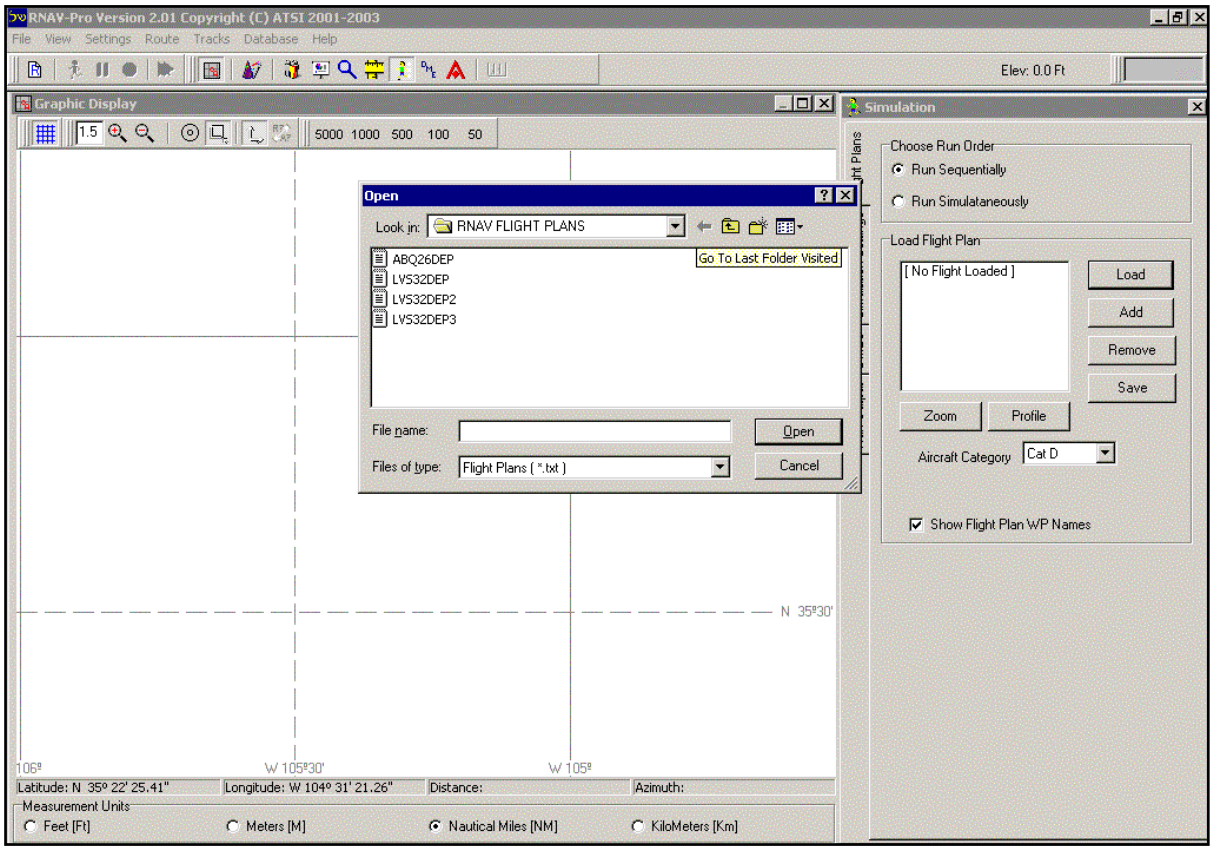
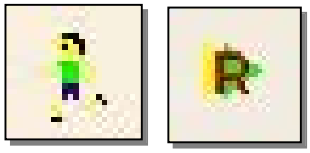


Figure 3-15: Loading a Flight Plan



If the **FPDIF** was successfully loaded:

- The **Run** and the **Erase Track Run** buttons become active.
- In the **Simulation Module/Flight Plan Tab,** the loaded **FPDIF name** will appear.

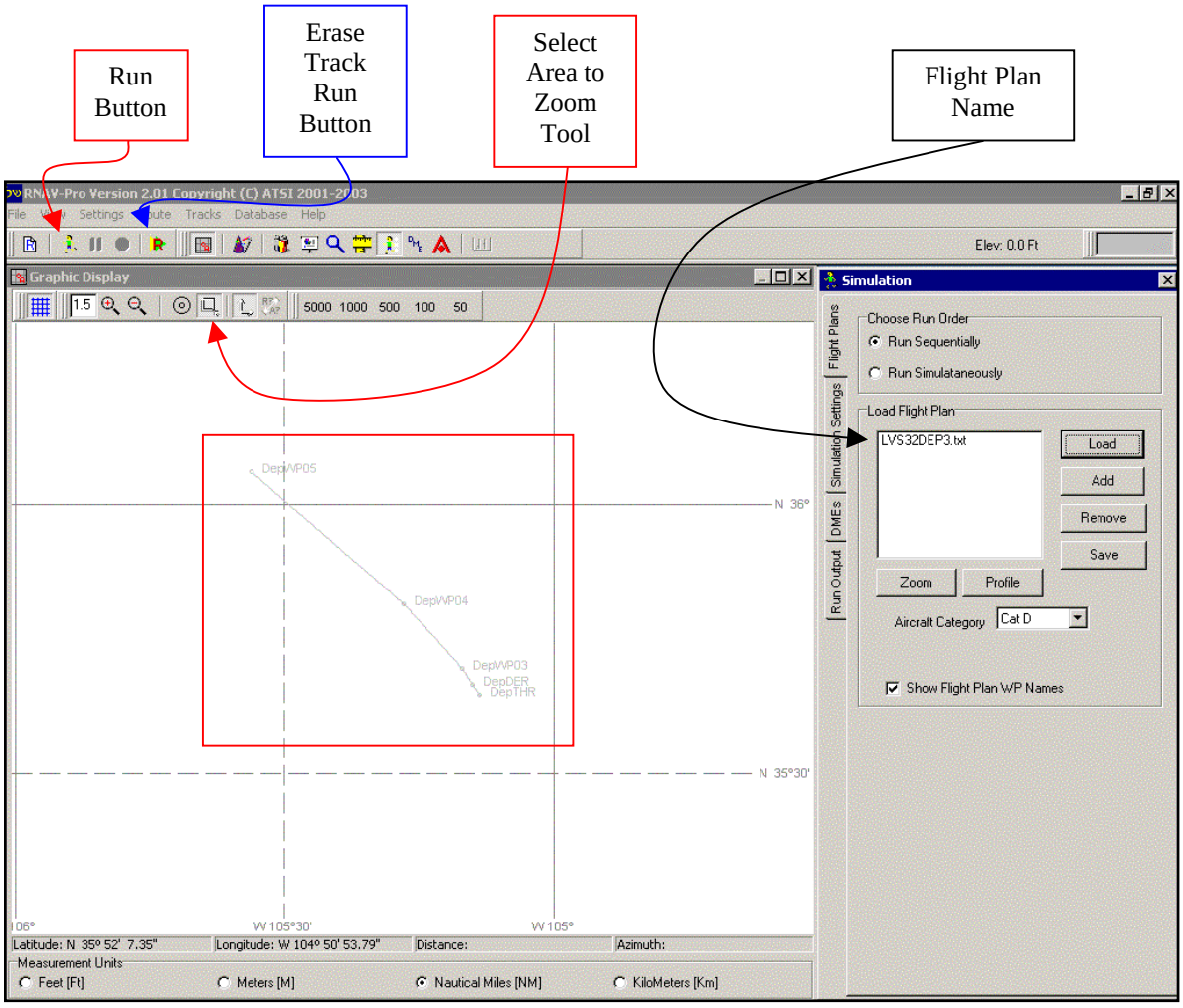
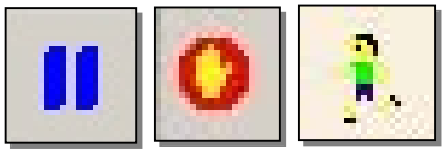


Figure 3-16: Main Display Window After Loading Flight Plan

Use the **Select an Area to Zoom** tool to zoom in on the flight plan as shown in the figure above.



3.3.2 Running an FPDIF

For Flyability, DME, Radar, and Communications Screening, select the desired screening options in the appropriate Simulation Module tabs (see Section 2.6.4), then press the **Run** button to initiate the simulation.

- The flight track is initiated and proceeds along the selected route.
- The **Pause** and **Stop** square button becomes activated.
- The **Sim. Time** (in seconds) in the upper right corner of the Main Display Window will cease incrementing when the track has completed.
- An RNAV-Pro **Results Summary** also appears at the conclusion of the simulation (See Section 4.0).

DME Screening

If DME Screening has been selected as one of the screening modes desired, the track colors displayed pertain to the DME screen only. For DME Screening, the colors are:

- **Blue:** INS drift model is being used for calculations instead of DMEs (since less than two DMEs are available) and values are within acceptable limits (i.e., below maximum error allowed).
- **Green:** DME Screening values are within acceptable limits (i.e., below maximum error allowed).
- **Red:** Screening values (calculated from INS drift or DMEs) exceed maximum error allowed.
- **Orange:** Indicates the segment where a Critical DME exists.

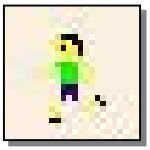
Flyability, Radar, and Communications Screening

When Flyability, Radar, and/or Communications Screening have been selected (without DME Screening), the track color display is:

- **Blue:** Screening has been performed.

Results of Flyability Screening can be viewed by proceeding to the Results Summary for Flyability.

Results of Radar and/or Communications Screening can be viewed by proceeding to the Results Summary for Radar or Communications and selecting the Show Coverage checkbox. The route display indicates green or red (comparable to the color definitions associated with DME Screening).



Note: A flight track terminates immediately if it is determined NOT flyable because of a major discrepancy. Please refer to Section 4.2.1, Flyability Results.

Move the mouse over the flight track generated by RNAV-Pro. The **ToolTip Box** displays relevant information regarding the flight track at the location selected. The **ToolTip Box** contains the following information:

Item	Name & Description	Units
1	Segment: The position between two relevant points	N/A
2	Latitude	Direction and Deg: Min: Sec.Sec *
3	Longitude	Direction and Deg: Min: Sec.Sec *
4	Time: Simulation time at relevant point	Seconds
5	Altitude	Feet
6	IAS: Indicated Airspeed	Knots
7	Course: Ground Track (True)	Degrees
8	DME Error	Nautical Miles (RMS)
9	Travel Distance: Travel distance from simulation start	Nautical Miles
10	Bank Angle of Aircraft	Degrees

* Hundredth of a second

Note: At the completion of **each** flight run, a summary of results will appear. The summary contains all relevant information concerning potential problems that might be encountered during the flight causing the flight plan to be deemed "unflyable." Please refer to Chapter 4 (Results) for more information on results.

Following the route run, select **"Clear"** from the **Tracks** drop-down menu. This erases the track currently displayed.

If clearing the route is also desired, select **"Clear All"** from the **Routes** drop-down menu to clear the route currently displayed.

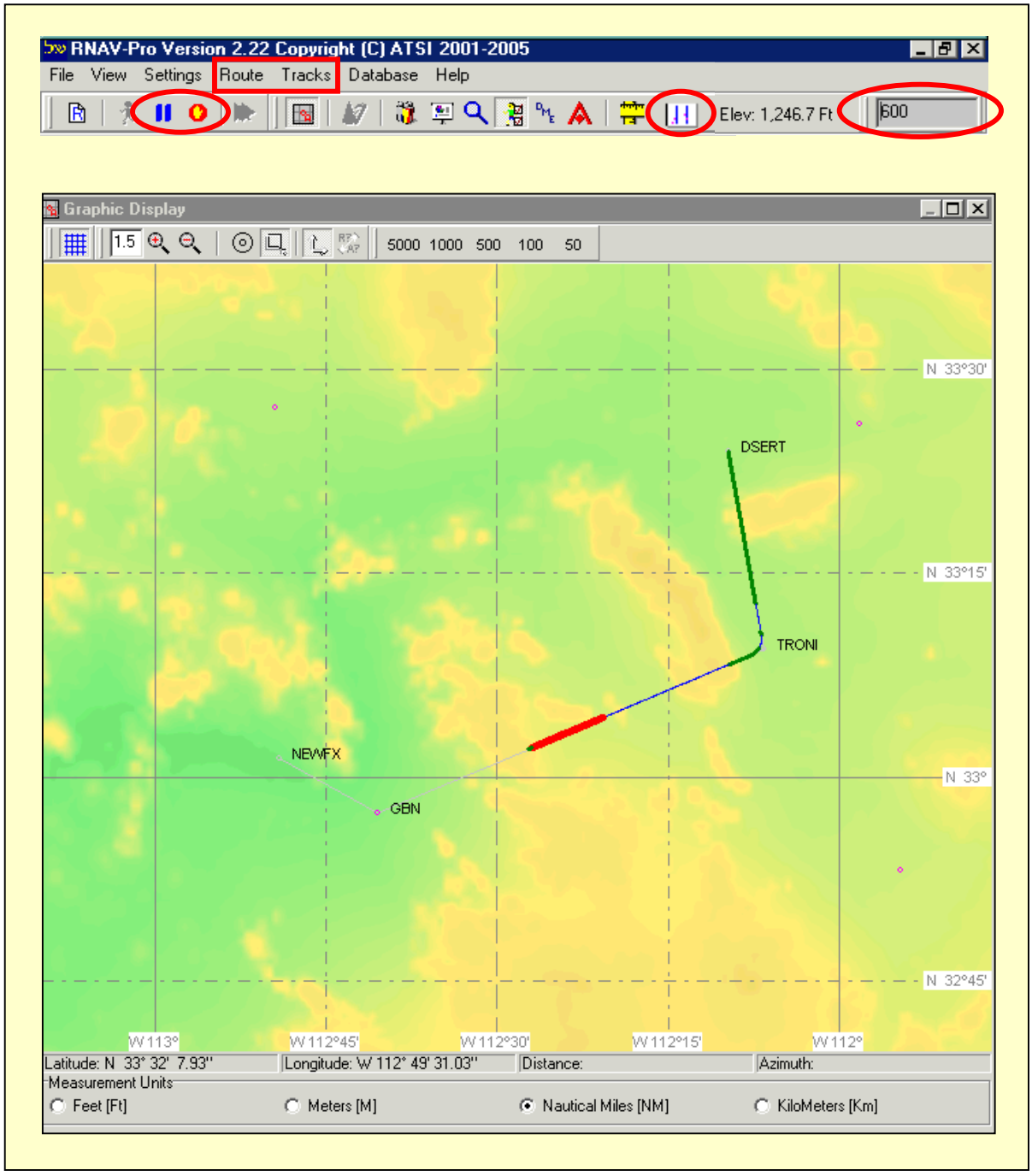


Figure 3-17: Flight Track Flown for Flight Plan

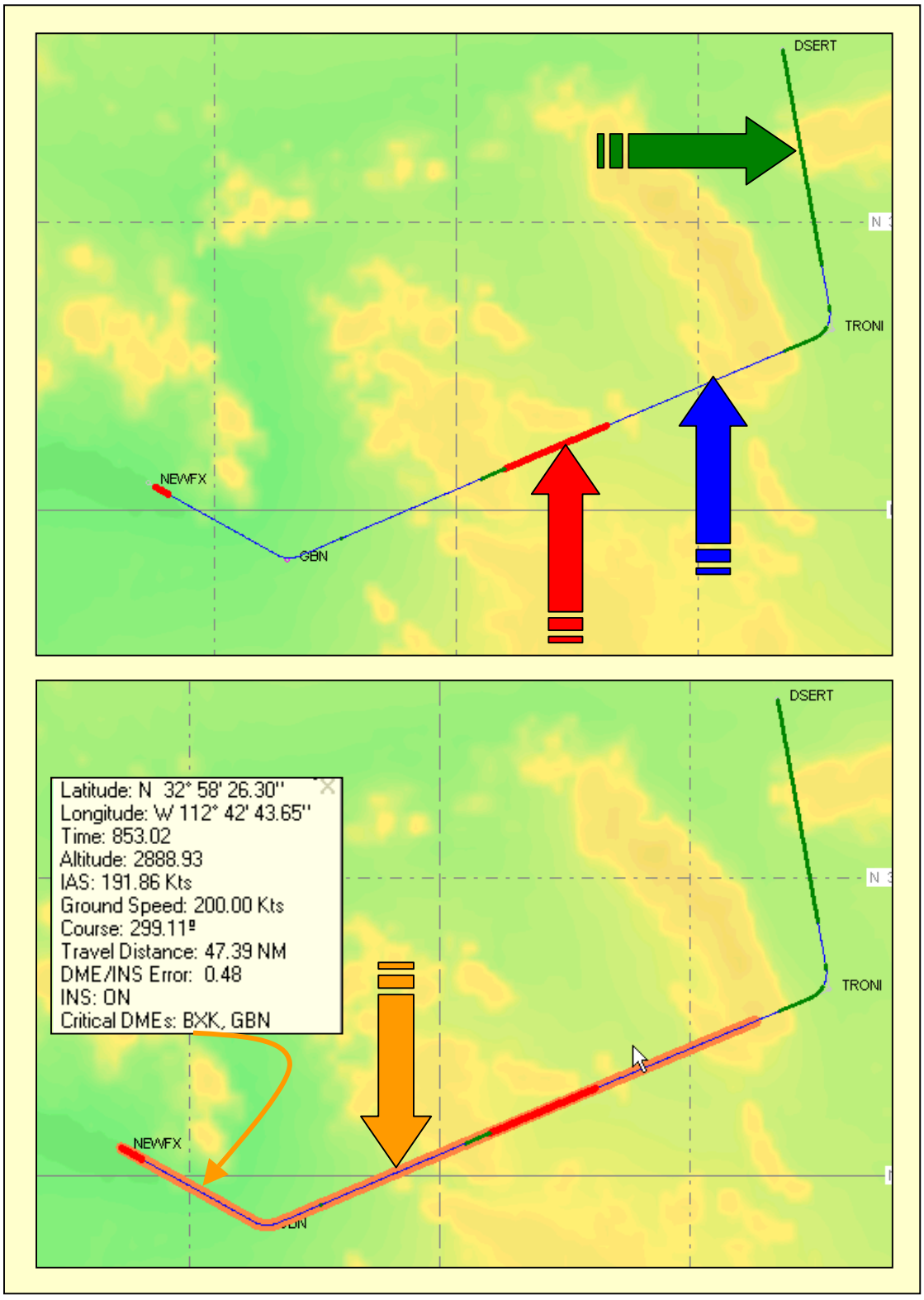
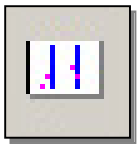


Figure 3-18: DME Screening Colors/ToolTip Box Information

3.3.3 TERPS Generation Via an FPDIF

To conduct TERPS Screening, the user must select an airport runway (for departures or approaches) via the Flight Plan Wizard (see Section 3.1.2) or the Search Data Module.

Following airport runway selection, the subsequent generation and evaluation of the TERPS surface are performed by selecting the appropriate **Generate Surface** and **Eval** buttons in the appropriate TERPS Module tabs.



4.0 Results Module

A **Results Summary** is automatically generated when a flight plan is run by RNAV-Pro. The Results Summary is also obtained by pressing the **Show Results** button in the RNAV-Pro Main Display Window.

4.1 Obtaining Results

The **Results** Module appears at the completion of flight runs. Detailed information is provided for the types of screening conducted. The Results Module includes selections for: General Information, Overview, Flight Plan, Flyability, DME Screen, Radar Screen, Communications Screen, Interactive Graph, TERPS, and engine out.

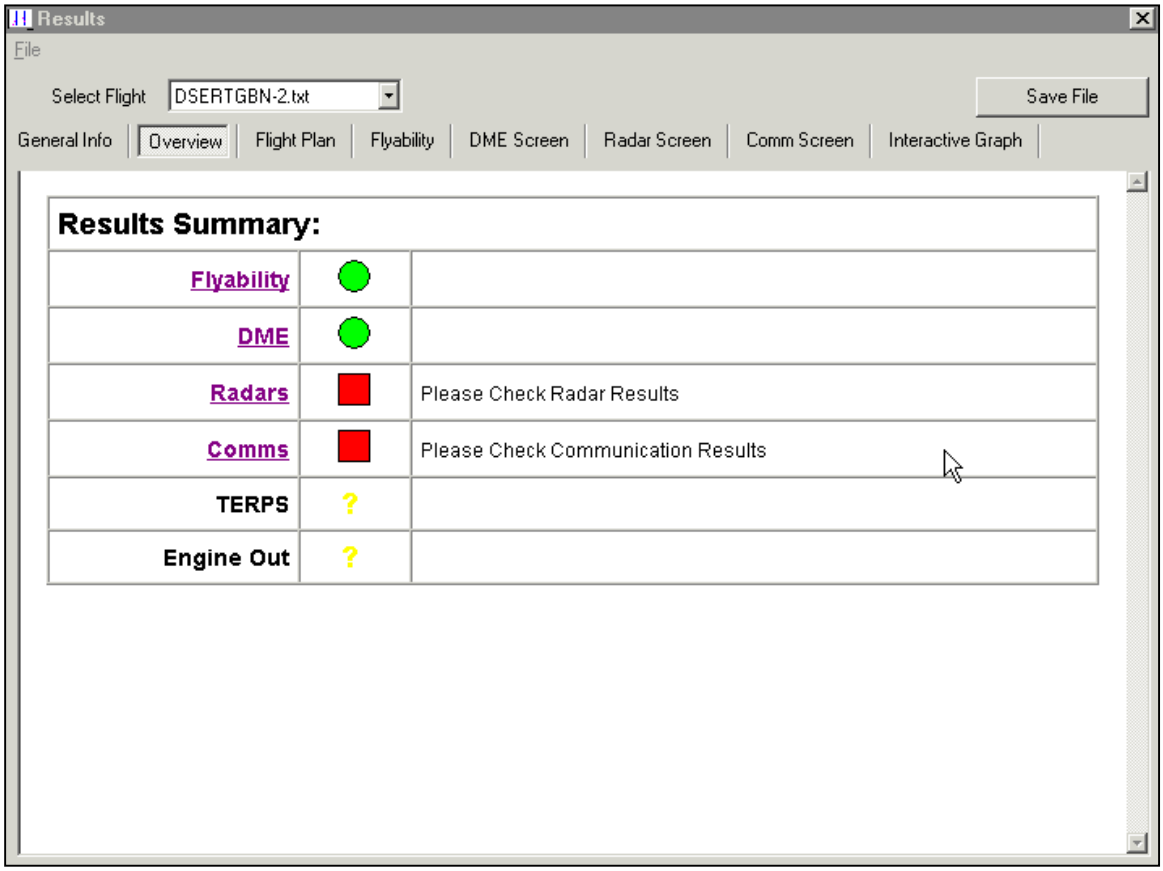


Figure 4-1: Results Module

4.2 Interpreting Results

The **Results** Module includes the following results from the screens that were run.

4.2.1 General Information on Results

This General Info Tab gives the basic information on the extra flight plan: User Name, Project Name, Software and Version, Date, Time, and the Input File location.

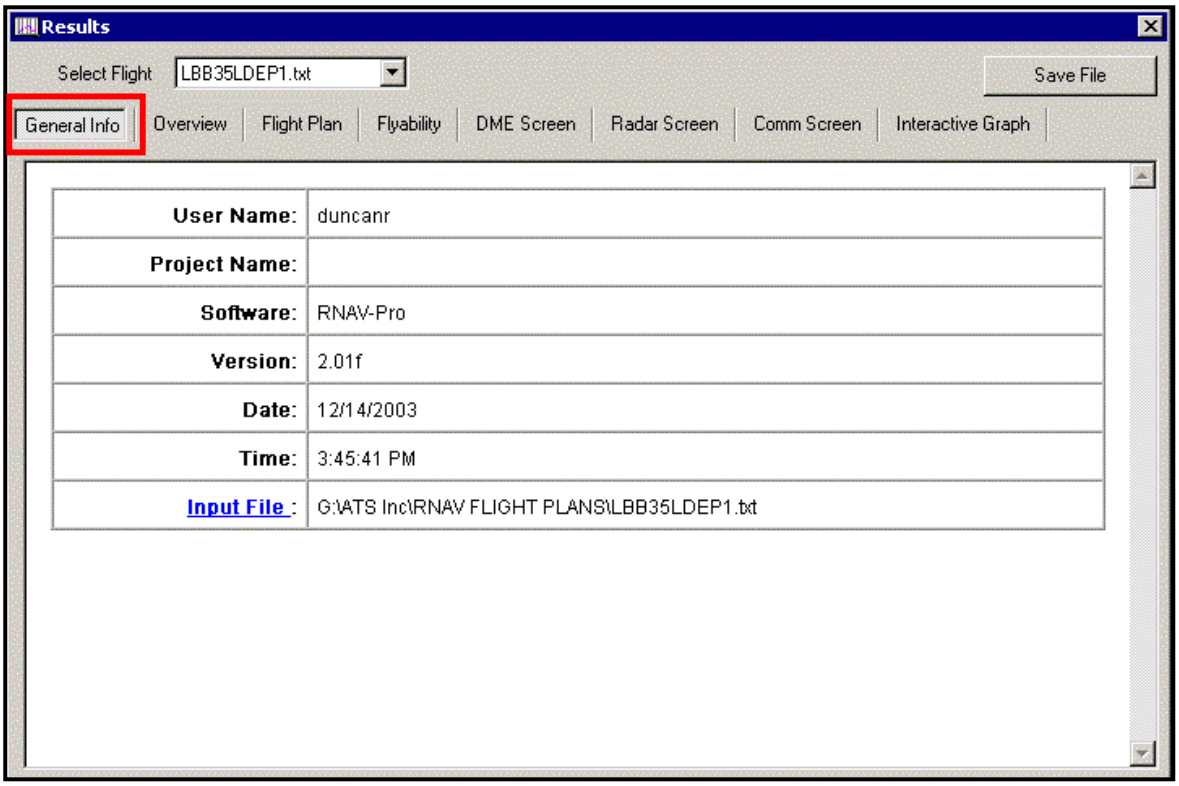
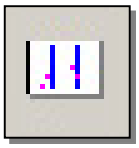


Figure 4-2: General Info Tab



4.2.2 Overview Results

The Overview Tab information provides easy-to-interpret initial results via:

- **Green circle:** Signifies that results for this screen were within acceptable limits. The words "Please Check DME Results" also appear to the right of the circle if critical DMEs have been identified.

- **Red square:** Signifies that results for this screen were out of tolerance (i.e., screen failed). The words "Please Check xxx Results" appear to the right of the square on all failures.

- **Yellow Question Mark:** Indicates that screening for this element was not requested; therefore, no results are available.

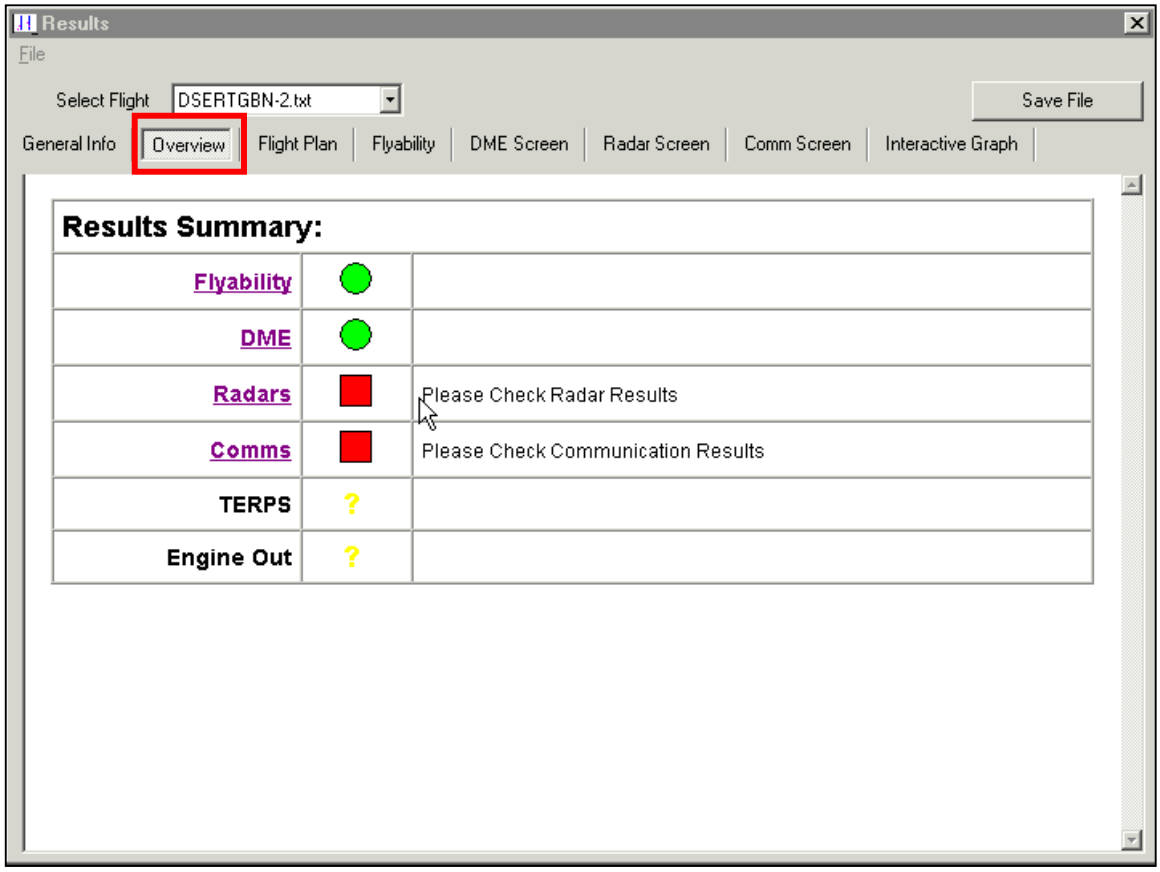
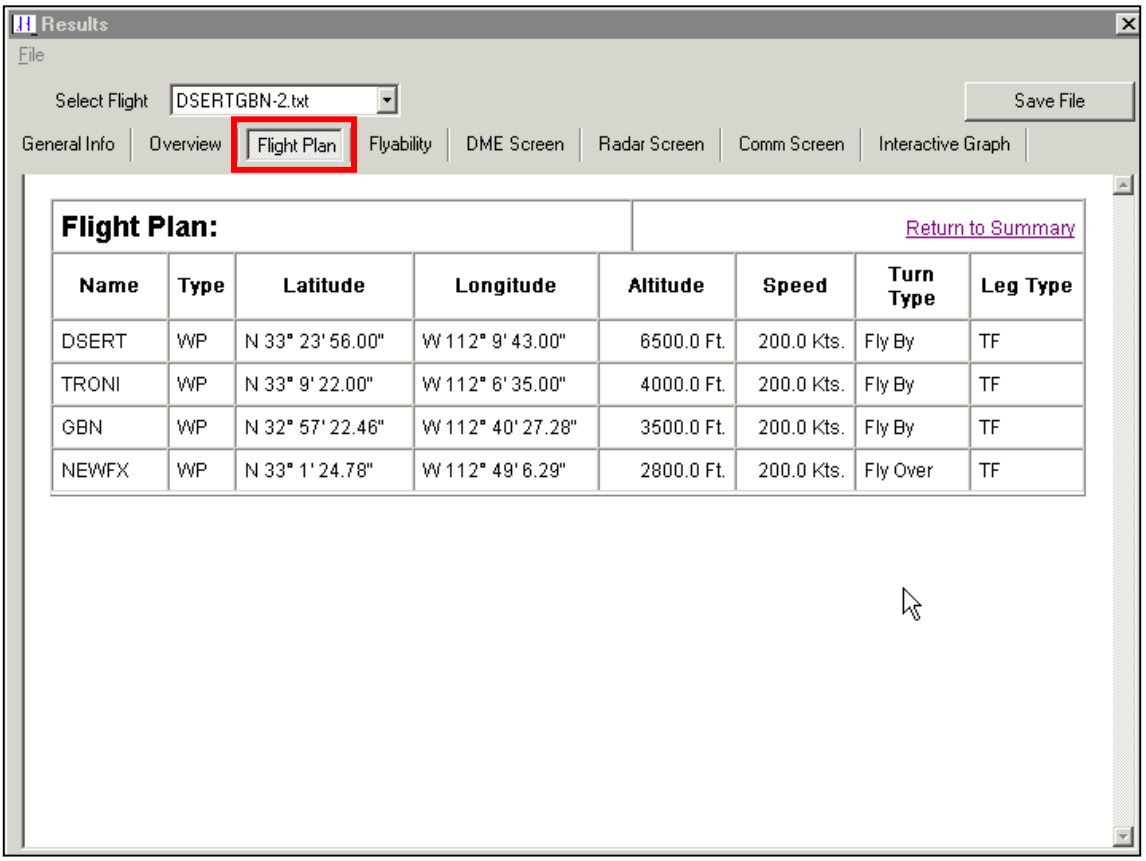


Figure 4-3: Overview Tab

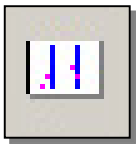
4.2.3 Flight Plan Results

The Flight Plan Tab gives the basic information on each leg of the flight plan: Name, Waypoint Type, Latitude, Longitude, Altitude, Speed, Turn Type, and Leg Type.



Name	Type	Latitude	Longitude	Altitude	Speed	Turn Type	Leg Type
DSERT	WP	N 33° 23' 56.00"	W 112° 9' 43.00"	6500.0 Ft.	200.0 Kts.	Fly By	TF
TRONI	WP	N 33° 9' 22.00"	W 112° 6' 35.00"	4000.0 Ft.	200.0 Kts.	Fly By	TF
GBN	WP	N 32° 57' 22.46"	W 112° 40' 27.28"	3500.0 Ft.	200.0 Kts.	Fly By	TF
NEWFX	WP	N 33° 1' 24.78"	W 112° 49' 6.29"	2800.0 Ft.	200.0 Kts.	Fly Over	TF

Figure 4-4: Flight Plan Tab



4.2.4 Flyability Results

The resulting text under the **Flyability Tab** appears in green or red and includes remarks on the flyability of the route. It also identifies problems (errors or warnings) associated with the aircraft's flight.

- **Green:** No discrepancies (i.e., entire track is flyable) or minor discrepancies (i.e., required IAS at waypoint could not be reached or altitude at waypoint was too low) were noted that did not cause termination of the flight .

- **Red:** Major discrepancies (i.e., the route was not deemed flyable) were noted that caused termination of the flight .

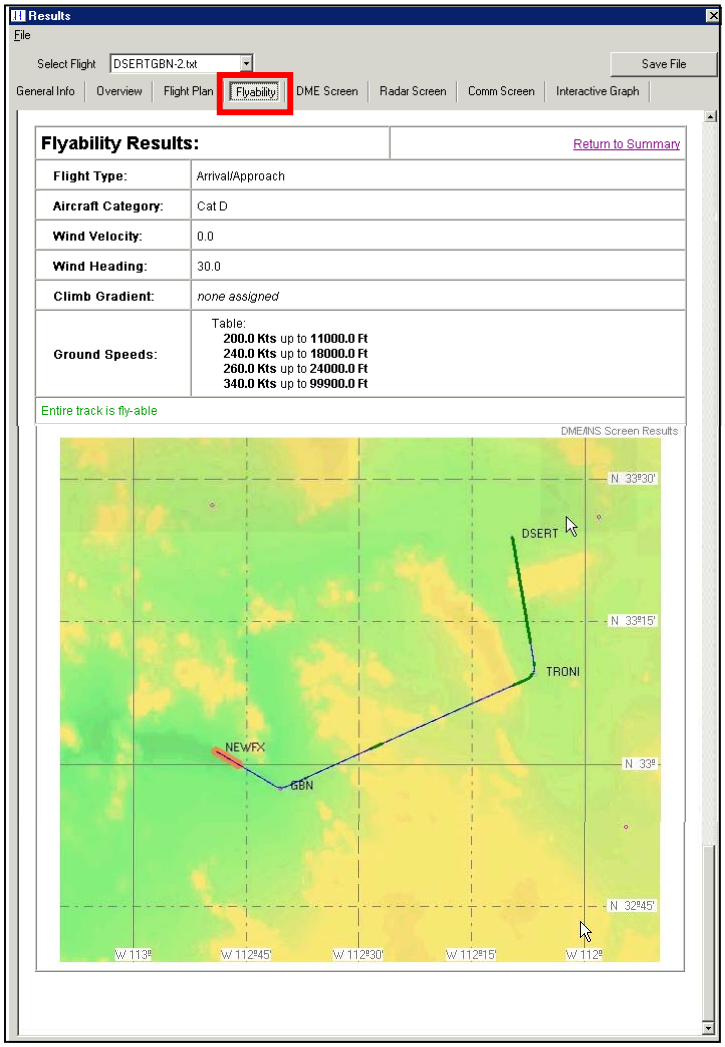
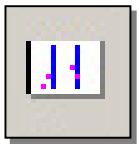


Figure 4-5: Flyability Tab



4.2.5 DME Screen Results

The results are provided in three forms: text, table, and graph.

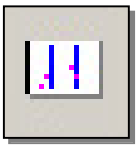
4.2.5.1 Text

- **Screen Settings:** The text includes the specific details selected for the analysis.
- **Total Number of DMEs Used:** DMEs are sequenced in the order of their initial detection.
- **Maximum DME Error Using ALL DMEs:** Specifies the maximum error in nautical miles and thousandths.
- **Number of Critical DMEs found:** Displays the total number Critical DME facilities.

4.2.5.2 Table

The table includes specific details about each DME used in the analysis.

- **Name:** Three letter identifiers listed in the order of their initial detection.
- **Location:**
  - Latitude in degrees:minutes:seconds.hundredths of seconds.
  - Longitude in degrees:minutes:seconds.hundredths of seconds.
- **SV/Range (Service Volume Range):** Terminal, low, or high.
- **Source:** Indicates either **AVN** database or **User** database.
- **Critical:** Specifies "YES" if the DME is critical, "NO" if it is not critical, or "N/A" if critical analysis was not requested. The DME is determined to be critical if removing it from service causes a DME screen to exceed the maximum allowable error.
- **Err.[NM]:** Specifies the maximum error obtained during DME Screening when this DME was removed for critical screening analysis. "N/A" signifies that critical analysis was not requested.
- **Status:** Specifies whether the DME is to be enabled or disabled during the screening process. The status is initially set to "Enabled" and can only be disabled by the user toggling DMEs within this column. For example, the user can toggle specific DMEs from "Enabled" to "Disabled" and rerun the screen. This yields new results and a modified DME table by ignoring those DMEs that have been disabled and possibly adding DMEs into the analysis that did not appear in the previous run.



Note:	If the user wishes to disable one or more DMEs listed in the table and rerun the screen using **only** the remaining DMEs in the table, then the "Disable Others" box must be checked at the bottom of the display. Whenever one or more DMEs have been disabled, the **Enable All** button should be pressed after screening is completed to enable all DMEs for future runs.

- **Time:** The percentage of total flight time that the DME was used in the analysis.

- **Distance:** The percentage of the total distance that the DME was used in the analysis.

- **Clear Usage:** Clears the yellow coverage highlight associated with selection of a particular DME via the Show Coverage checkbox. The flight track on the RNAV-Pro Graphic Display returns to its original appearance.

- **Disable Others:** Limits DMEs selected in a rerun of a screen to those already listed in the table.

4.2.5.3 Graph

The graph provides information on the flight track. Distance (as the simulation travels) in nautical miles is plotted on the x-axis, and the FMS Navigational System Error in nautical miles is plotted on the y-axis. The Plot Upper Range radial buttons modify the display of the y-axis. Available increments are 0.5, 1.0, 2.0, 3.0, 4.0, 5.0, or 6.0 nautical miles. Plot color indicates results as follows:

  - **Blue:** Indicates INS drift model is being used for calculations (less than two DMEs are available) and values are within tolerance in this phase.

  - **Green:** Indicates DME Screening values are within tolerance in this phase.

  - **Red:** Indicates screening values (calculated from INS drift or DMEs) exceed tolerance limit in this phase.

- **Available DMEs:** All DMEs that are available on the screen are shown.

- **Required DMEs:** Are shown in red on the same row with Available DMEs.

- **Foreign DMEs:** All foreign facilities within 240NM are listed in the output. DOD facilities on foreign soil are not listed.

- **Inertial Drift Segments:** Indicates the start and stop location in latitude/longitude, the length of drift in nautical miles, and available DME facility with "from" and "to" locations in latitude and longitude.

- **DME Coverage Gaps:** Indicates the start and stop location in latitude/longitude and the length of the gap in nautical miles.

- **Flight Check DME Selection:** All selected Flight Check DMEs are listed. DMEs that are considered to be required are shown in red.

- **User DMEs:** Are shown when created and include Name, Lat/Long, and SV (Service Volume);. Indicate the program has created a ESV to fill a gap.

DME Screen Results: Return to Summary

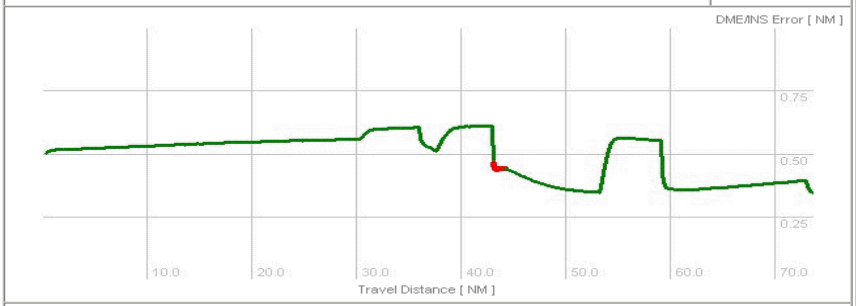
Screen Settings:	RNP: 2.0 NM Flight Mode: Manual DTED Used Restrictions Used INS: Disabled Testing for **ESV** Co-Frequencies Checked RNP Edges Checked	Min DME Range: 3.0 NM DME Types: VOR/DME , VORTAC , TACAN , User DOD Facilities (Not in NAS) Not Used Foreign Facilities Not Used

Total Number of DMEs Used:	6
Max. DME Error Using ALL 6 DMEs:	0.610NM

!! 3 CRITICAL DMEs Were Found !!

							Enable All	Usage By	
#	Name	Location	SV / Range	Source	Critical	Err.[NM]	Status	Time	Distance
1	SNY	N 41° 5' 48.00" W 102° 58' 58.80"	H + **ESV**	**User**	YES	GAPS	Enabled	58.3%	58.2%
2	HCT	N 40° 27' 14.62" W 100° 55' 24.86"	H	Database	NO	0.567	Enabled	41.2%	41.1%
3	MCK	N 40° 12' 13.67" W 100° 35' 39.21"	H	Database	YES	GAPS	Enabled	55.7%	55.7%
4	LBF	N 41° 2' 55.00" W 100° 44' 49.80"	L	Database	YES	GAPS	Enabled	35.8%	35.9%
5	OBH	N 41° 22' 32.65" W 98° 21' 12.94"	H	Database	NO	0.532	Enabled	8.0%	8.0%
6	CUZ	N 41° 29' 2.32" W 99° 41' 20.62"	L	Database	NO	0.532	Enabled	1.0%	1.0%
	Clear Usage						Disable Others		

DME/INS Error [NM] Interactive Graph

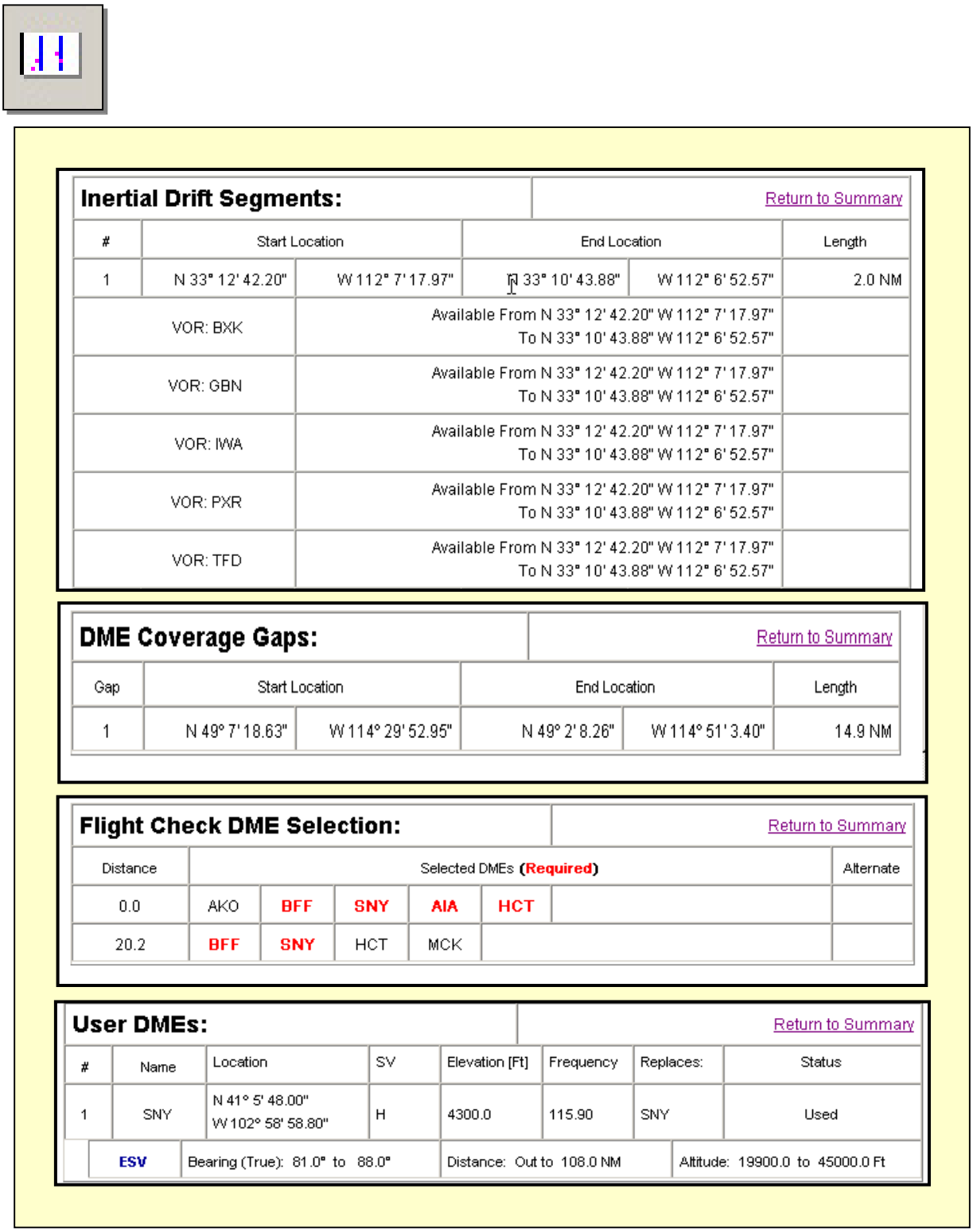


Available DMEs: SNY, BFF, HCT, MCK, LBF, OBH, CUZ

User DMEs: Return to Summary

#	Name	Location	SV	Elevation [Ft]	Frequency	Replaces:	Status
1	SNY	N 41° 5' 48.00" W 102° 58' 58.80"	H	4300.0	115.90	SNY	Used
	ESV	Bearing (True): 81.0° to 88.0°		Distance: Out to 108.0 NM			Altitude: 19900.0 to 45000.0 Ft

Figure 4-6: DME Screen Results



Inertial Drift Segments: Return to Summary

#	Start Location		End Location		Length
1	N 33° 12' 42.20"	W 112° 7' 17.97"	N 33° 10' 43.88"	W 112° 6' 52.57"	2.0 NM
VOR: BXK	Available From N 33° 12' 42.20" W 112° 7' 17.97" To N 33° 10' 43.88" W 112° 6' 52.57"				
VOR: GBN	Available From N 33° 12' 42.20" W 112° 7' 17.97" To N 33° 10' 43.88" W 112° 6' 52.57"				
VOR: IWA	Available From N 33° 12' 42.20" W 112° 7' 17.97" To N 33° 10' 43.88" W 112° 6' 52.57"				
VOR: PXR	Available From N 33° 12' 42.20" W 112° 7' 17.97" To N 33° 10' 43.88" W 112° 6' 52.57"				
VOR: TFD	Available From N 33° 12' 42.20" W 112° 7' 17.97" To N 33° 10' 43.88" W 112° 6' 52.57"				

DME Coverage Gaps: Return to Summary

Gap	Start Location		End Location		Length
1	N 49° 7' 18.63"	W 114° 29' 52.95"	N 49° 2' 8.26"	W 114° 51' 3.40"	14.9 NM

Flight Check DME Selection: Return to Summary

Distance	Selected DMEs (**Required**)						Alternate
0.0	AKO	**BFF**	**SNY**	**AIA**	**HCT**		
20.2	**BFF**	**SNY**	HCT	MCK			

User DMEs: Return to Summary

#	Name	Location	SV	Elevation [Ft]	Frequency	Replaces:	Status
1	SNY	N 41° 5' 48.00" W 102° 58' 58.80"	H	4300.0	115.90	SNY	Used
	ESV	Bearing (True): 81.0° to 88.0°		Distance: Out to 108.0 NM			Altitude: 19900.0 to 45000.0 Ft

Figure 4-7: Inertial Drift Segments, DME Coverage Gaps/Flight Check DME Selection/User DMEs

4.2.6 Radar Screen Results

Radar Screen Results are shown in graphic form. Distance (as the simulation travels) in nautical miles is plotted on the x-axis, and the y-axis displays the number of radars providing coverage for the flight.

- **Green:** Indicates screening is within tolerance (i.e., one or more radars are within range).
- **Red:** Indicates screening is out of tolerance (i.e., no radars are within range).
- **Blue:** When Radar Screening has been selected (without DME Screening), the track color on the Graphic Display will be blue, indicating that screening has been performed.

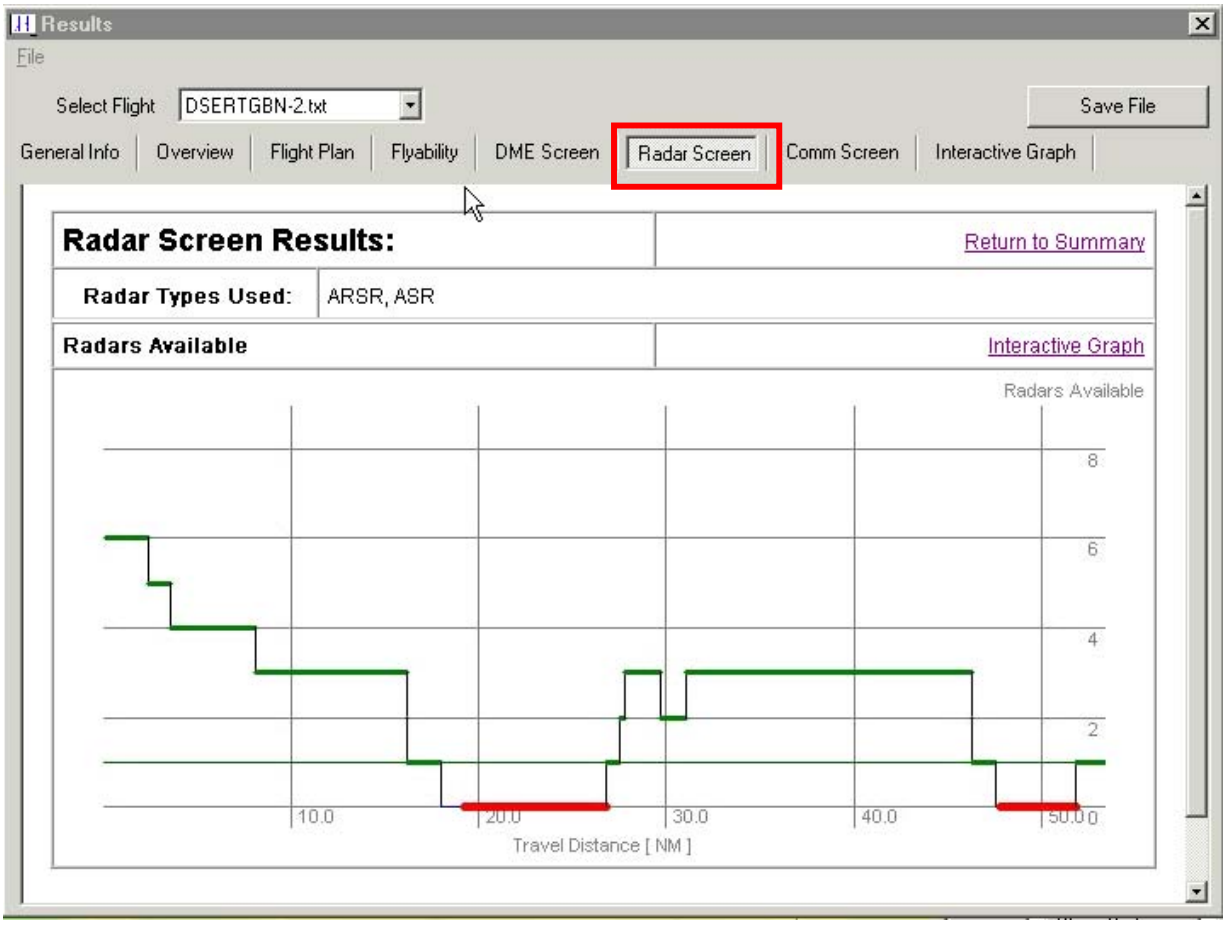
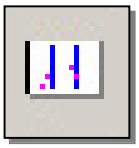


Figure 4-8: Radar Screen Results



4.2.7 Communications Screen Results

Communications Screen Results are shown in graphic form. Distance (as the simulation travels) in nautical miles is plotted on the x-axis, and the y-axis displays the number of communications facilities providing coverage for the flight.

- **Green:** Indicates screening is within tolerance (i.e., one or more radios are within the coverage area).
- **Red:** Indicates screening is out of tolerance (i.e., no radios are within the coverage area).
- **Blue:** When Communication Screening has been selected (without DME Screening), the track color on the Graphic Display will be blue, indicating that screening has been performed.

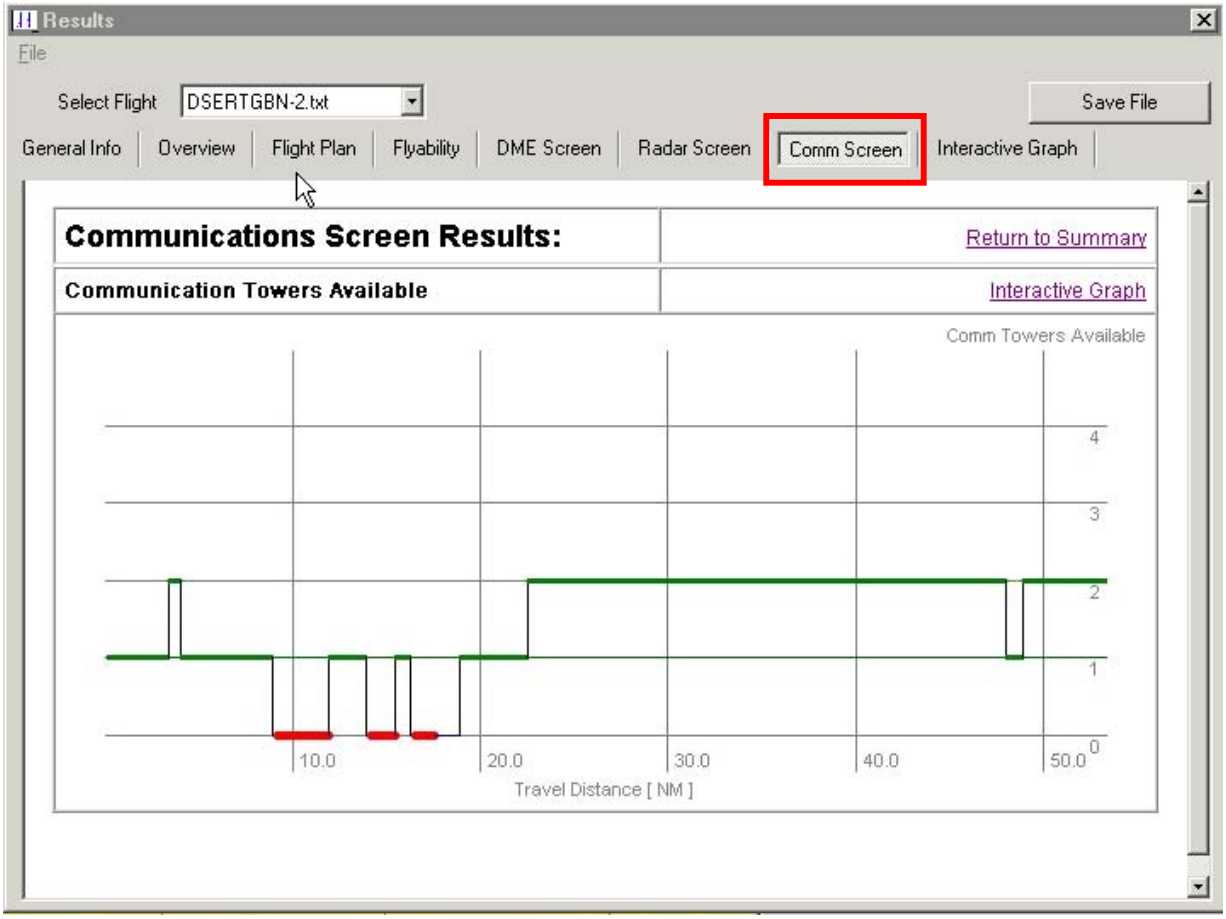


Figure 4-9: Communications Screen Results

4.2.8 Interactive Graph Results

This graph allows the user to choose drop-down menus to select graph (DME, Radar, and Comm) and display runs (DME) of simulation results along the flight track. The user can also choose upper range plotting parameters via radial buttons. This provides a look at spikes in the graph error.

- **DME Results:** Provides DME/INS error, distance, and DME names in use, and specifies if INS is in use.

- **Radar Results:** Shows distance (as the simulation travels) in nautical miles, number of radars providing coverage for the flight, and names of facilities.

- **Comm Results:** Shows distance (as the simulation travels) in nautical miles, the number of communications facilities providing coverage for the flight, and communication facility identifier.

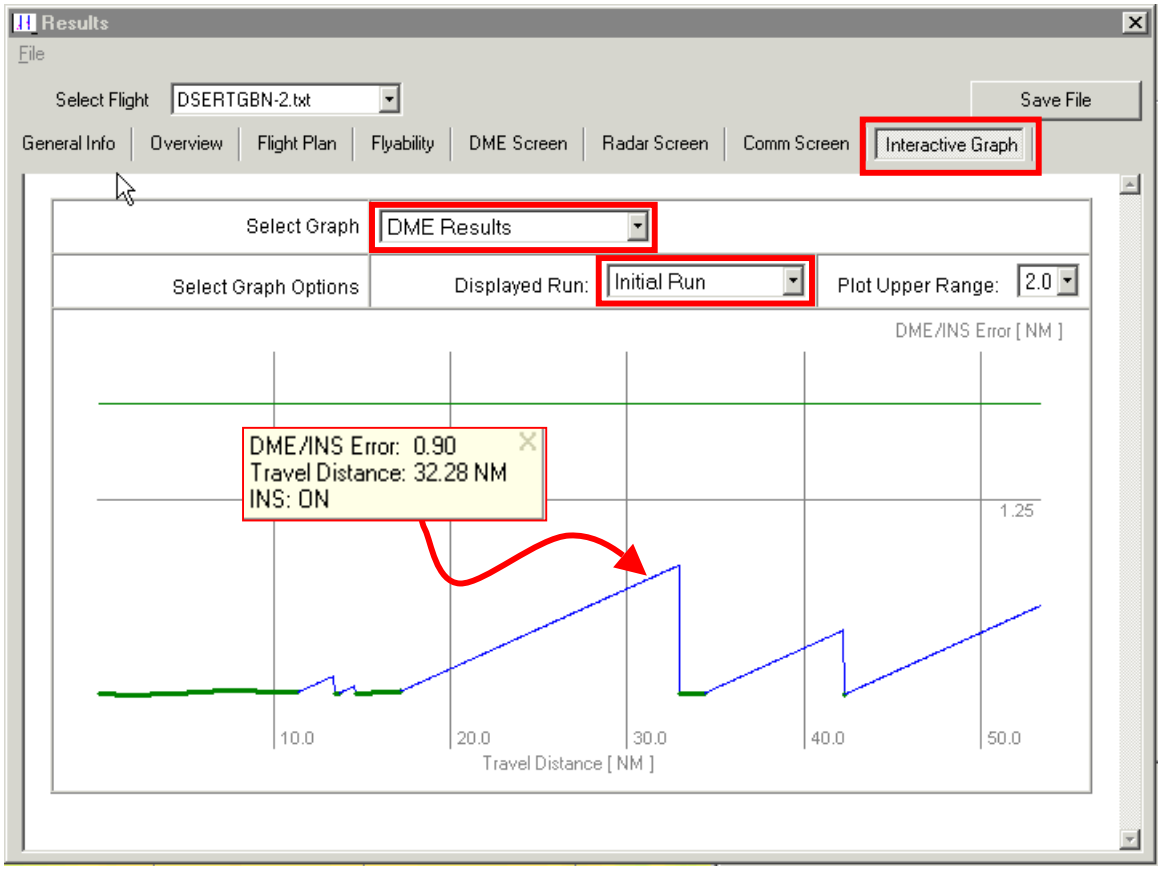
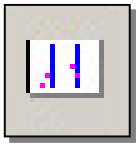


Figure 4-10: Interactive Graph Results



4.2.9 TERPS Results

Results are found under the Overview Tab and provide TERPS results for the following procedures and surfaces.

- FMS Departure (8260.40B)
- RNAV Departure (8260.44A)
- RNAV Approach (8260.48)
- RNAV En Route (8260.3B, Chapter 15)
- Engine Out.
- Generic Type 3 Surfaces (No evaluation of these surfaces are currently available.)

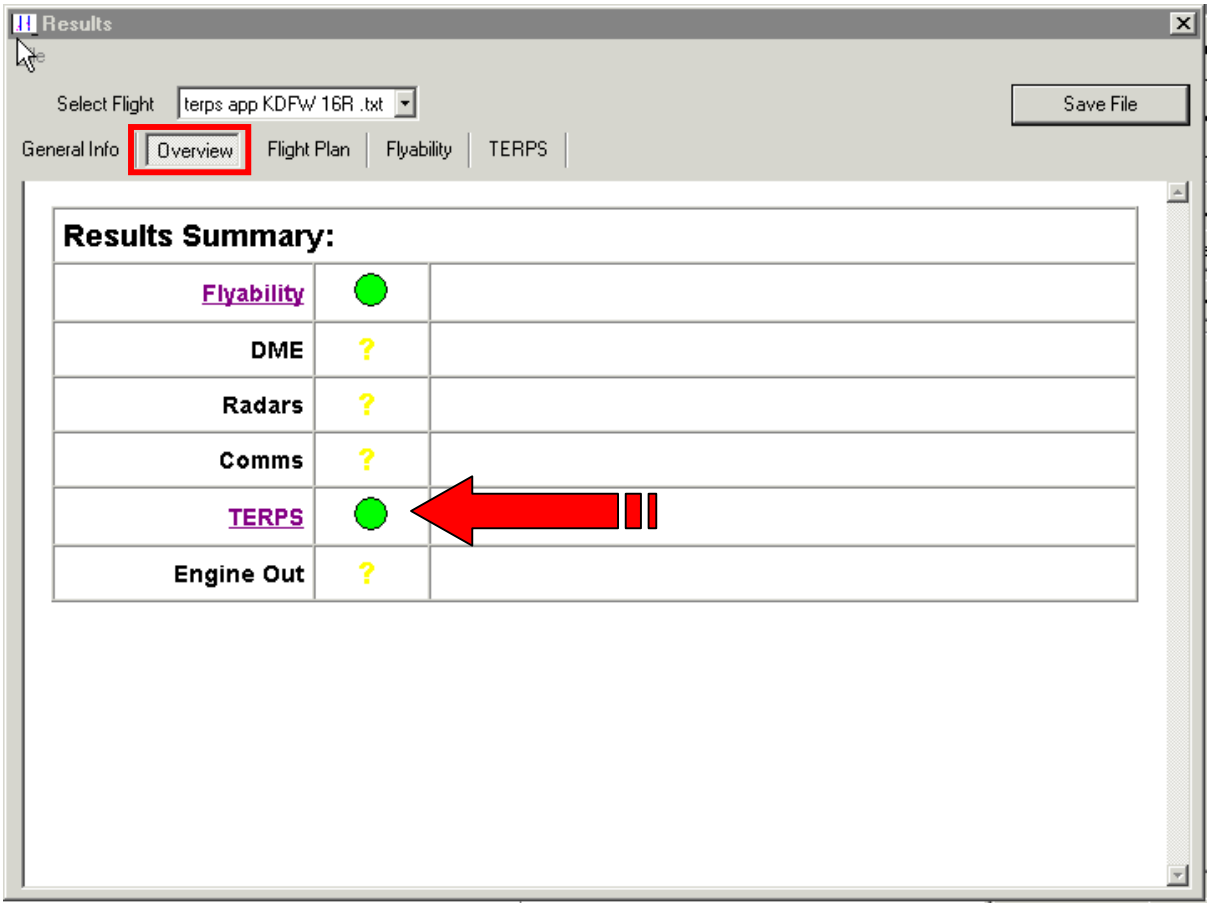
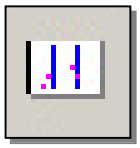


Figure 4-11: Overview Results



4.2.9.1 TERPS FMS Departure Results

The departure results table includes the procedure name, minimum controlling obstacle, and relevant obstacles.

- **Procedure name:** FMS Departure followed by the associated airport runway.

- **Minimum Required Climb Gradient:** Is indicated in feet per nautical mile and slope required to ensure obstacle clearance.

    - **Green:** N/A (not applicable). Indicates there are no TERPS penetrations.
    - **Red:** Indicates there is a TERPS penetration

- **Controlling Obstacle:**

    - **Terrain or Man-Made:** If the controlling obstacle is man-made, the type of structure will be entered; for example: Pole, Tower, or Tank.

    - **Latitude:** obstacle in degrees:minutes:seconds.hundredths of seconds.

    - **Longitude:** obstacle in degrees:minutes:seconds.hundredths of seconds.

    - **Elevation [MSL]:** The obstacle is depicted in feet and hundredth of a foot.

    - **Clearance or Penetration:** For an obstacle that does not penetrate the TERPS surface, the word "Clearance" and associated height (in feet) is green. For an obstacle that penetrates the TERPS surface, the word "Penetration" and associated height (in feet) is red.

- **Relevant Obstacle:**

    - **Obstacle ID:** Terrain or DOF number for man-made obstacle.

    - **Latitude:** obstacle in degrees:minutes:seconds.hundredths of seconds.

    - **Longitude:** obstacle in degrees:minutes:seconds.hundredths of seconds.

    - **Elevation (MSL):** obstacle in feet and hundreds of a foot.

    - **Type:** A descriptive name of the type of man-made obstacle.

    - **Clearance or Penetration:** For an obstacle that does not penetrate the TERPS surface, the word "Clearance" and associated height (in feet) is green. For an obstacle that penetrates the TERPS surface, the word "Penetration" and associated height (in feet) is red.

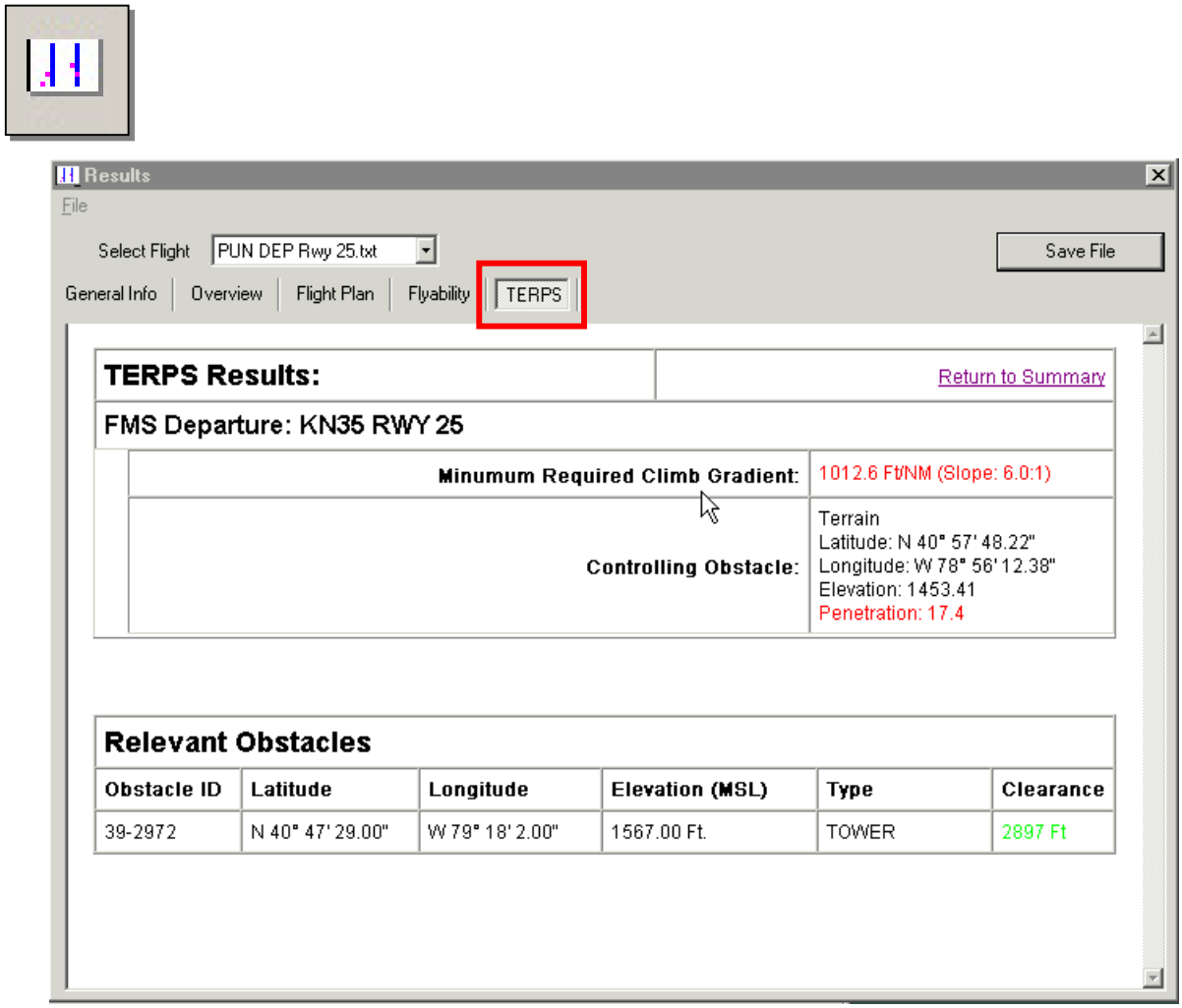
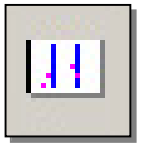


Figure 4-12: TERPS FMS Departure Results



4.2.9.2 TERPS RNAV Approach Results

Provides name, minimums, segment definition, and obstacle data for the approach.

- **Procedure name:** Approach name followed by the airport runway.

- **Minimums:**

    - **MDA:** Minimum Descent Altitude.
    - **Visibility:** Visibility in NM and tenths of NM.
    - **TCH:** Threshold Crossing Height in feet.
    - **GSA:** Glide Slope Angle in degrees.
    - **FAF Altitude:** Final Approach Fix altitude in feet.

- **Segment Definition:** Each approach segment (initial, intermediate, final) includes:

    - **WP Name:** Waypoint name.
    - **WP Lat:** Waypoint latitude in degrees:minutes:seconds.hundredths of seconds.
    - **WP Lon:** Waypoint longitude in degrees:minutes:seconds.hundredths of seconds.
    - **Track:** Aircraft track in degrees.
    - **Length:** Segment length in nautical miles.

Controlling Obstacle:

- **Obstacle:** Terrain or Digital Obstacle File (DOF) number for man-made obstacle.
- **Latitude:** obstacle in degrees:minutes:seconds.hundredths of seconds.
- **Longitude:** obstacle in degrees:minutes:seconds.and hundredths of seconds.
- **Elevation MSL:** obstacle in feet and hundreds of a foot.
- **Type:** A descriptive name of the type of man-made obstacle.

Relevant Obstacle:

- **Obstacle ID:** Terrain or DOF number for man-made obstacle.

- **Latitude:** obstacle in degrees:minutes:seconds.hundredths of seconds.

- **Longitude:** obstacle in degrees:minutes:seconds.hundredths of seconds.

- **Elevation (MSL):** obstacle in feet and hundreds of a foot.

- **Type:** A descriptive name of the type of man-made obstacle.

- **Clearance or Penetration:** For an obstacle that does not penetrate the TERPS surface, the word “Clearance” and associated height (in feet) is green. For an obstacle that penetrates the TERPS surface, the word “Penetration” and associated height (in feet) is red.

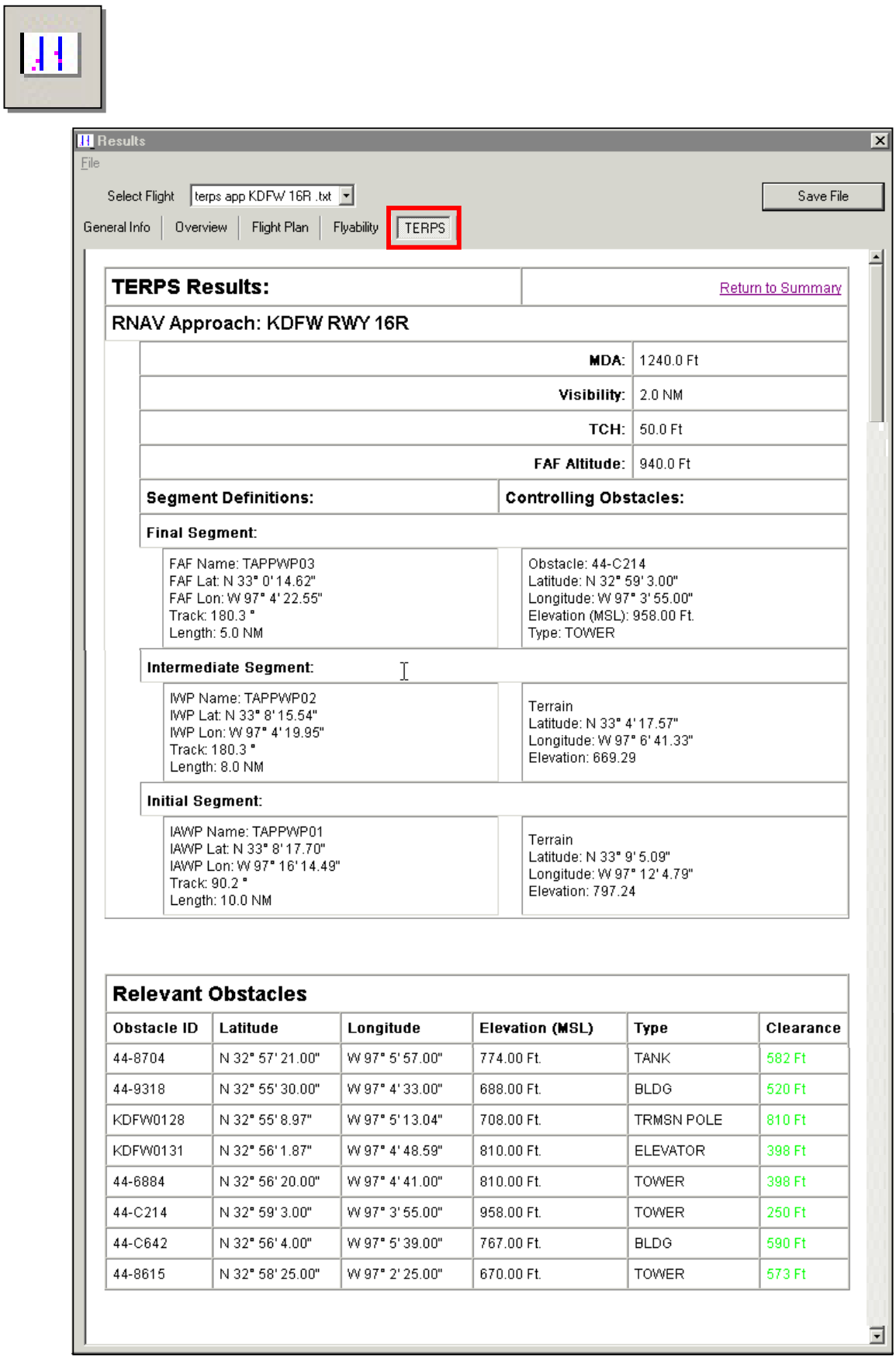
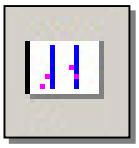


Figure 4-13: TERPS RNAV Approach Results



4.2.9.3. TERPS RNAV En Route Results

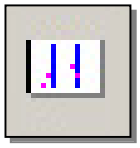
RNAV-Pro generates and evaluates 8260.3, Chapter 15 primary and secondary areas.

En-Route Procedures:

- **Controlling Obstacle:**
    - **Obstacle ID:** Terrain or DOF number for man-made obstacle.
    - **Latitude:** obstacle in degrees:minutes:seconds.hundredths of seconds.
    - **Longitude:** obstacle in degrees:minutes:seconds.hundredths of seconds.
    - **Elevation:** obstacle in feet and hundreds of a foot.
    - **Clearance or Penetration:** For an obstacle that does not penetrate the TERPS surface, the word "Clearance" and associated height (in feet) is green. For an obstacle that penetrates the TERPS surface, the word "Penetration" and associated height (in feet) is red.

Relevant Obstacle:

- **Obstacle ID:** Terrain or DOF number for man-made obstacle.
- **Latitude:** obstacle in degrees:minutes:seconds.hundredths of seconds.
- **Longitude:** obstacle in degrees:minutes:seconds.hundredths of seconds.
- **Elevation (MSL):** The obstacle in feet and hundreds of a foot.
- **Type:** A descriptive name of the type of man-made obstacle.
- **Clearance or Penetration:** For an obstacle that does not penetrate the TERPS surface, the word "Clearance" and associated height (in feet) is green. For an obstacle that penetrates the TERPS surface, the word "Penetration" and associated height (in feet) is red.



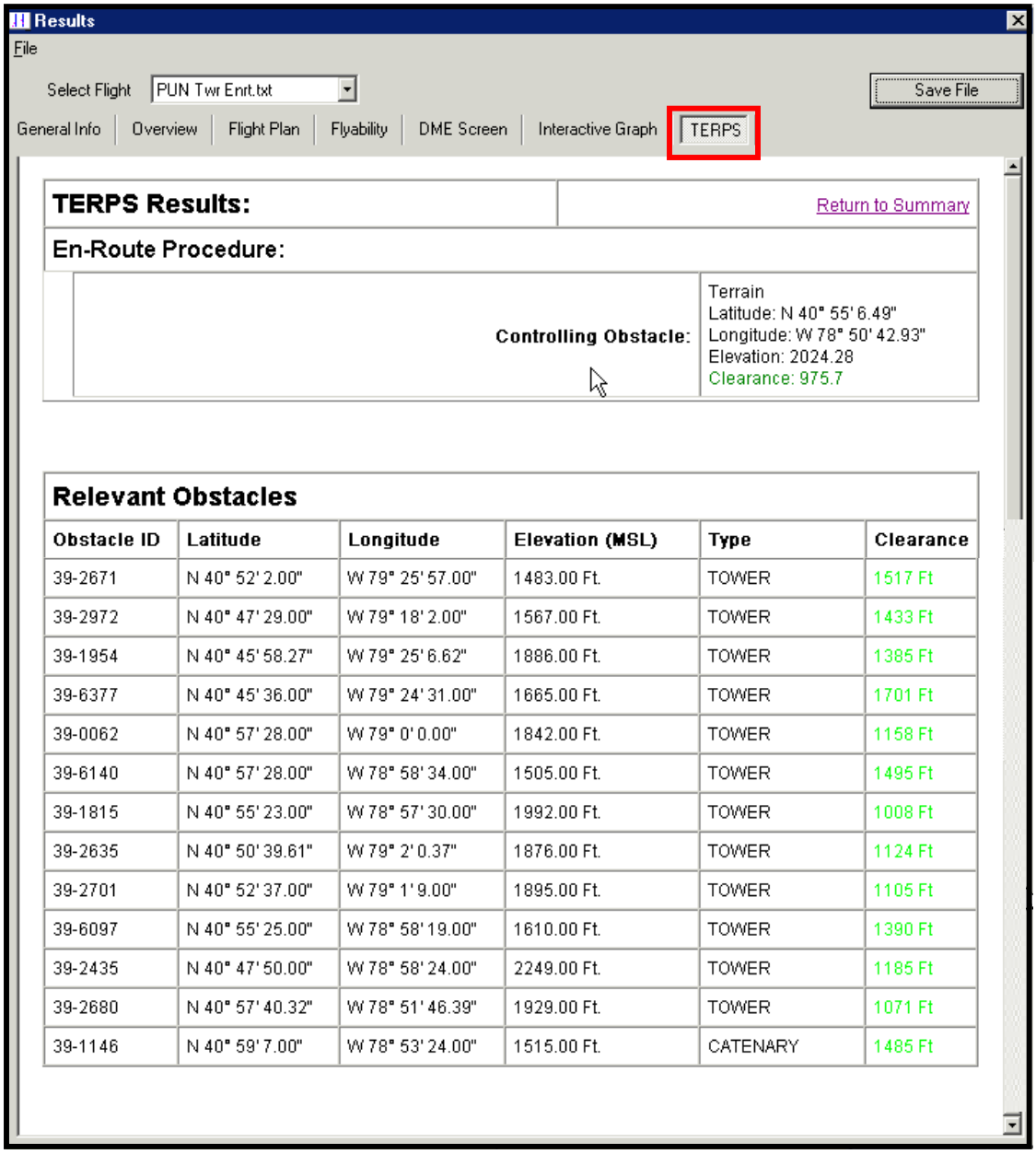


Figure 4-14: TERPS RNAV Approach Results (cont'd)

4.3 Saving Results

Pressing the **Save Results** button in the Summary Tab of the Results Module creates a/an:

- **Folder:** Created in the Results subdirectory. The folder is given the name of the input file.
- **HTML Results file:** Created in the Results subdirectory. The file contains the information included in the Results Module. The Results file is given the name of the input file with a "Results.html" extension.

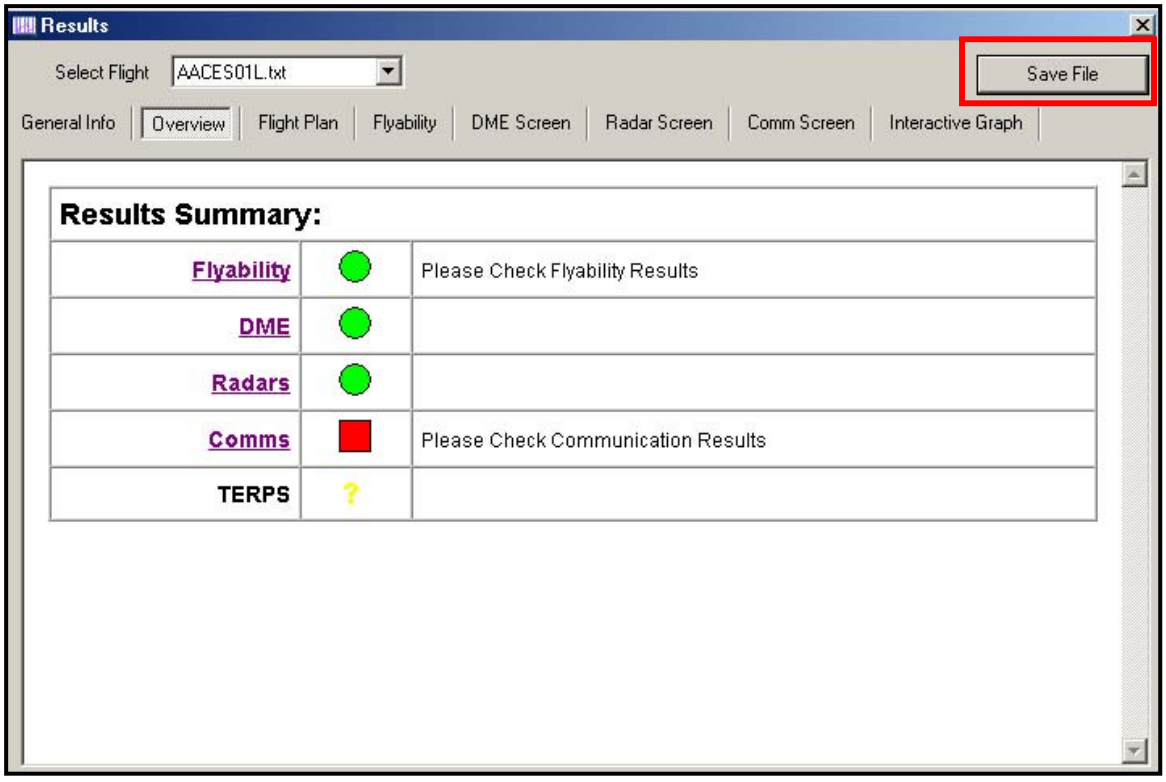
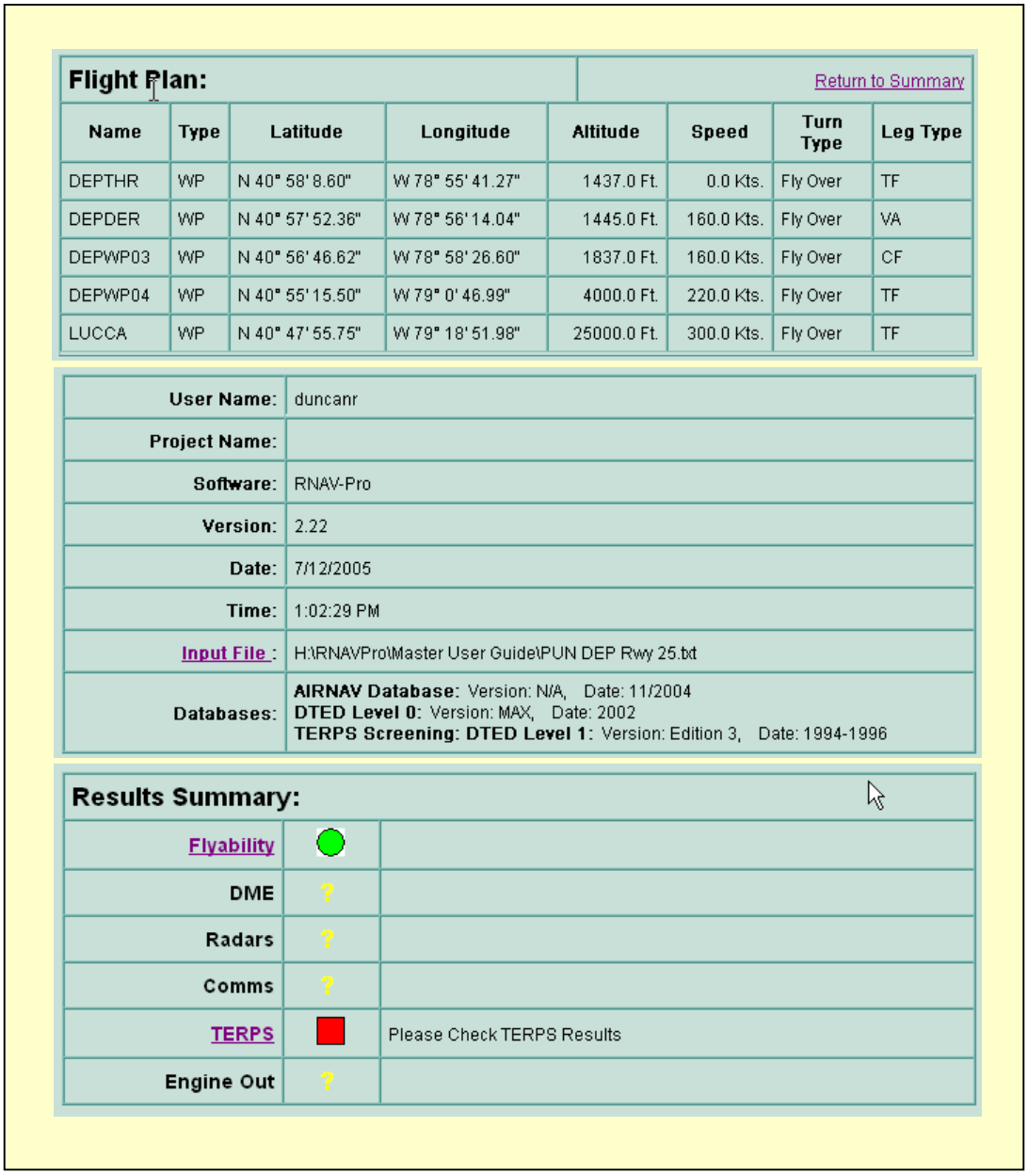


Figure 4-15: Saving Results

4.4 Printing Results

An **HTML Results file** is created by pressing the **Save Results** button in the Summary Tab of the Results Module. Once opened (via a double click on the file), the file may be printed by selecting **"Print"** from the **File** drop-down menu.



Flight Plan: Return to Summary

Name	Type	Latitude	Longitude	Altitude	Speed	Turn Type	Leg Type
DEPTHR	WP	N 40° 58' 8.60"	W 78° 55' 41.27"	1437.0 Ft.	0.0 Kts.	Fly Over	TF
DEPDER	WP	N 40° 57' 52.36"	W 78° 56' 14.04"	1445.0 Ft.	160.0 Kts.	Fly Over	VA
DEPWP03	WP	N 40° 56' 46.62"	W 78° 58' 26.60"	1837.0 Ft.	160.0 Kts.	Fly Over	CF
DEPWP04	WP	N 40° 55' 15.50"	W 79° 0' 46.99"	4000.0 Ft.	220.0 Kts.	Fly Over	TF
LUCCA	WP	N 40° 47' 55.75"	W 79° 18' 51.98"	25000.0 Ft.	300.0 Kts.	Fly Over	TF

User Name:	duncanr
Project Name:	
Software:	RNAV-Pro
Version:	2.22
Date:	7/12/2005
Time:	1:02:29 PM
Input File :	H:\RNAVPro\Master User Guide\PUN DEP Rwy 25.txt
Databases:	**AIRNAV Database:** Version: N/A, Date: 11/2004 **DTED Level 0:** Version: MAX, Date: 2002 **TERPS Screening: DTED Level 1:** Version: Edition 3, Date: 1994-1996

Results Summary:

Flyability		
DME	?	
Radars	?	
Comms	?	
TERPS		Please Check TERPS Results
Engine Out	?	

Figure 4-16: Saving Results, page 1

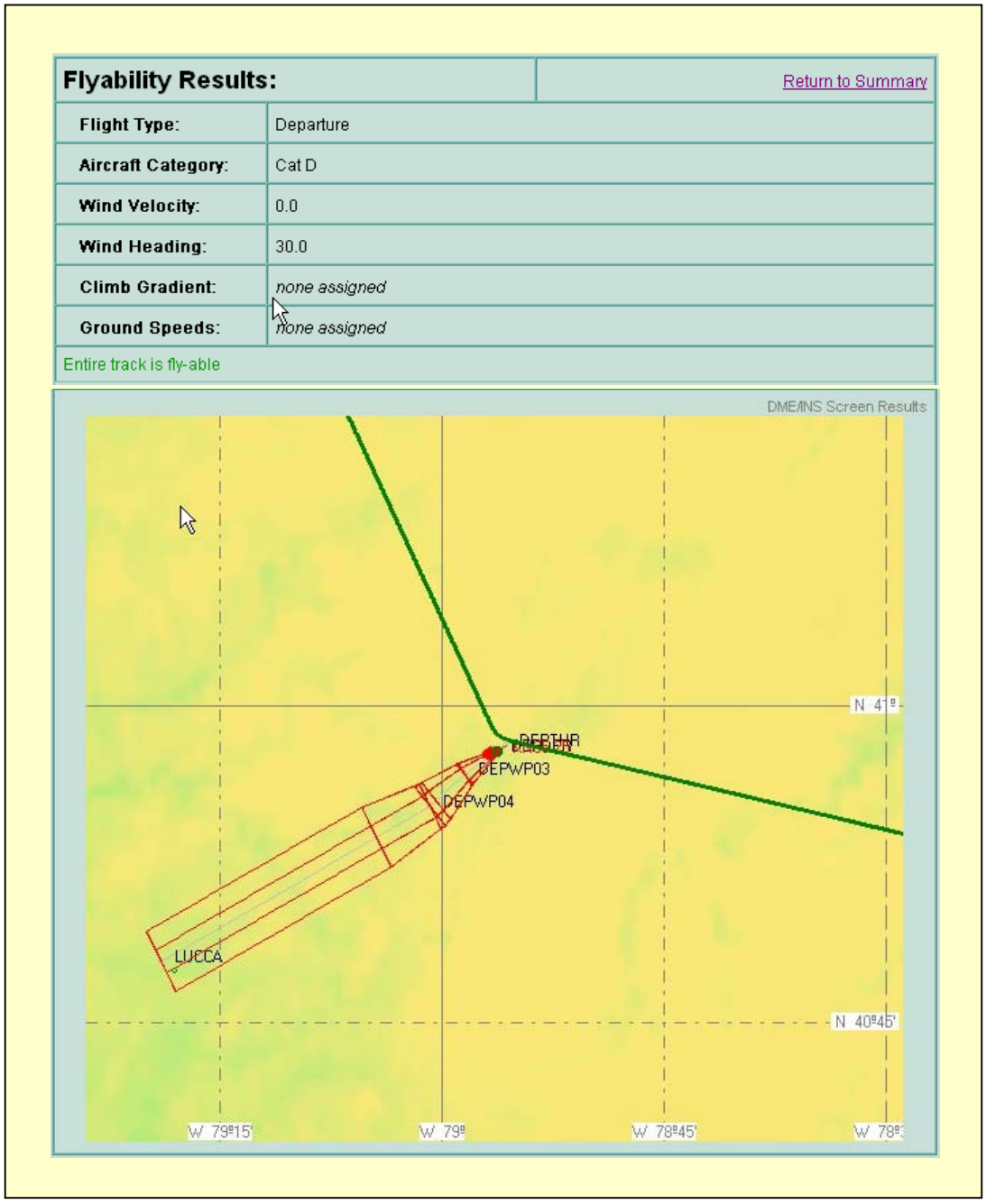


Figure 4-17: Saving Results, page 2

5.0 Reporting Problems or Offering Suggestions

The **Submit a Report** option from the Report drop-down menu allows the user to submit a report to the FAA's Flight Operations Simulation and Analysis Branch in order to:

- **Identify a problem** that the user has encountered with RNAV-Pro.
- **Offer a suggestion** that will increase the utility of RNAV-Pro.

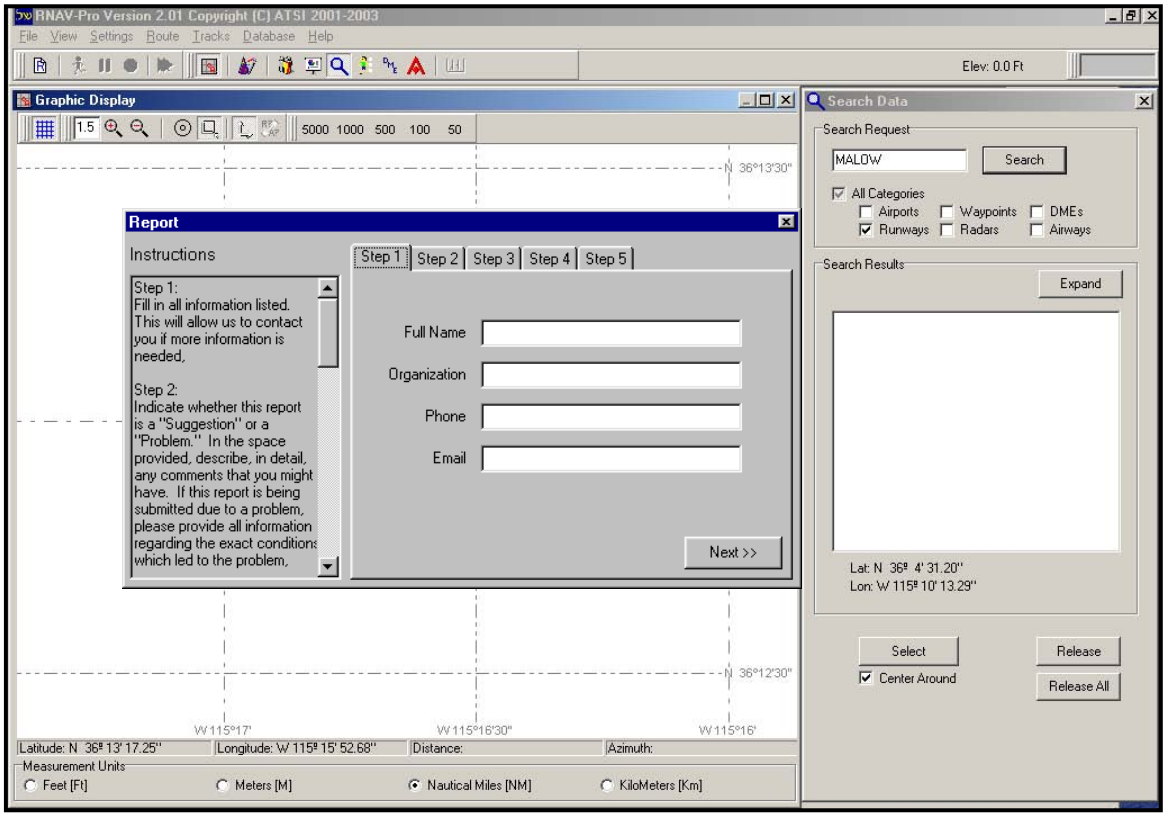


Figure 5-1: Submitting a Report on a Problem or Suggestion

5.1 Step 1: Supply User Information

Fill in all user information requested. This allows us to contact you if more information is needed. Then, select **"Next."**

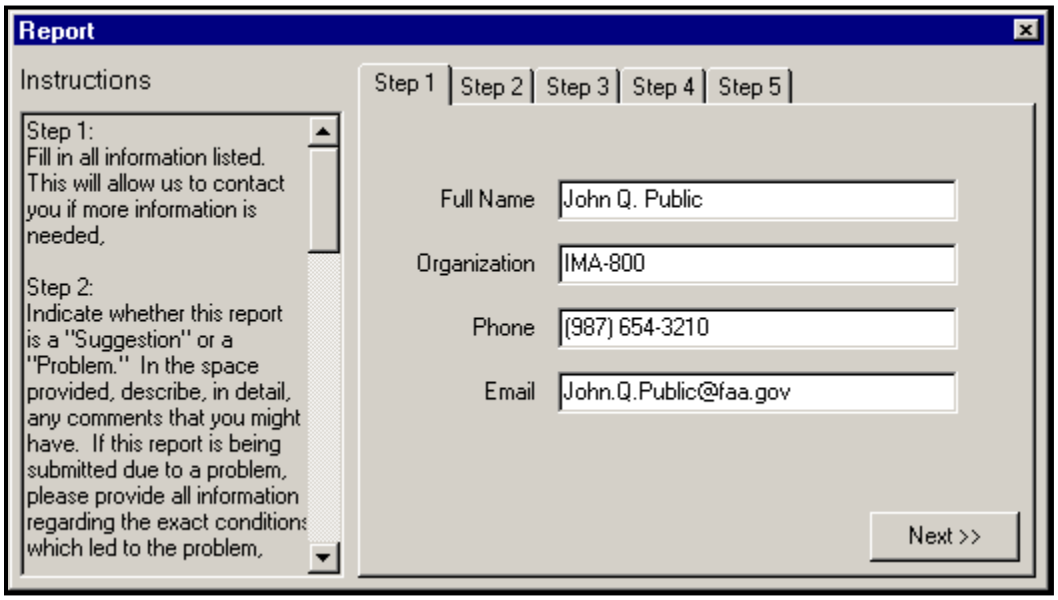


Figure 5-2: Problem Submission, Step 1

5.2 Step 2: Supply Problem/Suggestion Information

Select the appropriate radial button to indicate whether this report is a suggestion or a problem. In the space provided, describe in detail any comments that you might have. If this report is being submitted due to a problem, please provide all information regarding the exact conditions that led to the problem, including but not limited to:

- Any and all non-default conditions (category of aircraft, wind values, etc.).
- Types of screening that were used (DME, Radars, Communications, TERPS).
- If DME Screening was used, all information that is relevant (assigned DME range or Standard Service Volumes, RNP and flight mode, types of DMEs used, etc.).

The information you provide will be used to recreate the problem and develop a solution. Then, select **"Next."**

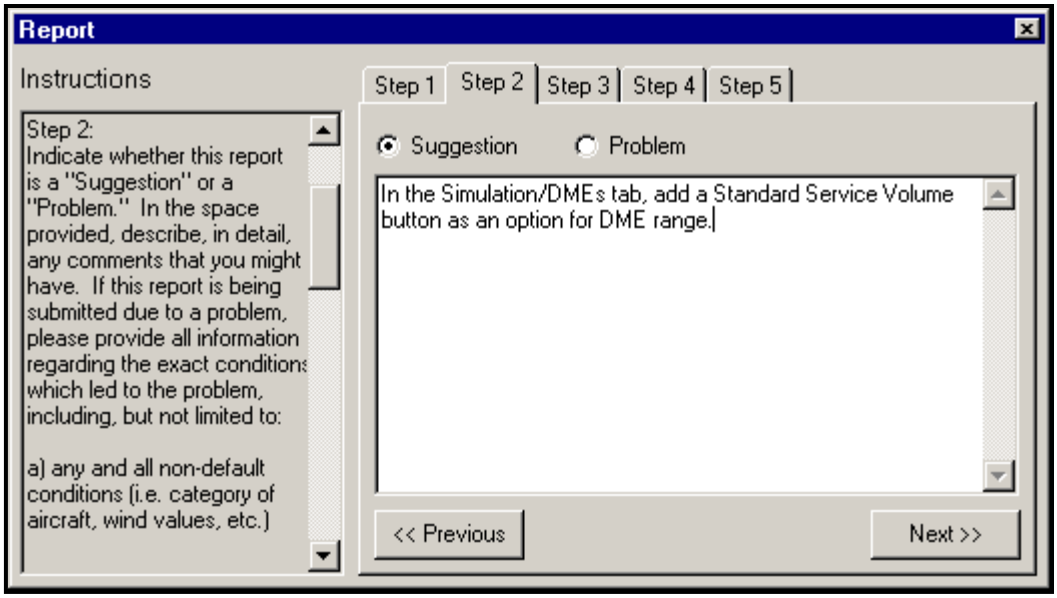


Figure 5-3: Problem Submission, Step 2

5.3 Step 3: Supply Input File Location

If a problem has occurred using a specific input file, please provide the name of the file here. The contents of the input file are copied directly into the file specified in Step 4. Then, select **"Next."**

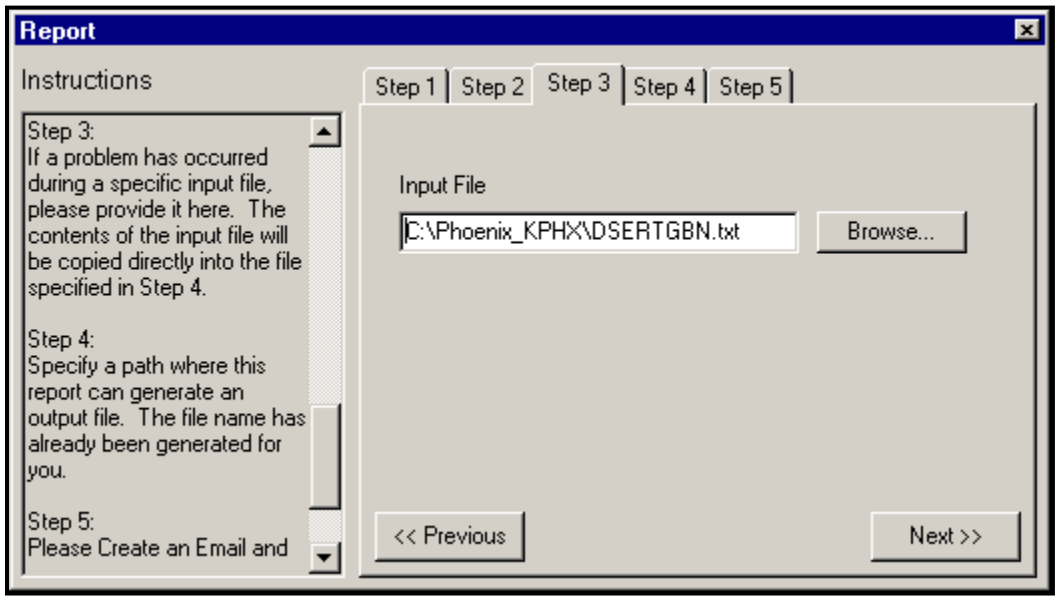


Figure 5-4: Problem Submission, Step 3

5.4 Step 4: Select Results Folder

Specify a location on the hard drive in which this report can generate a Results file. The file name has already been generated for you. Then, select **"Next."**

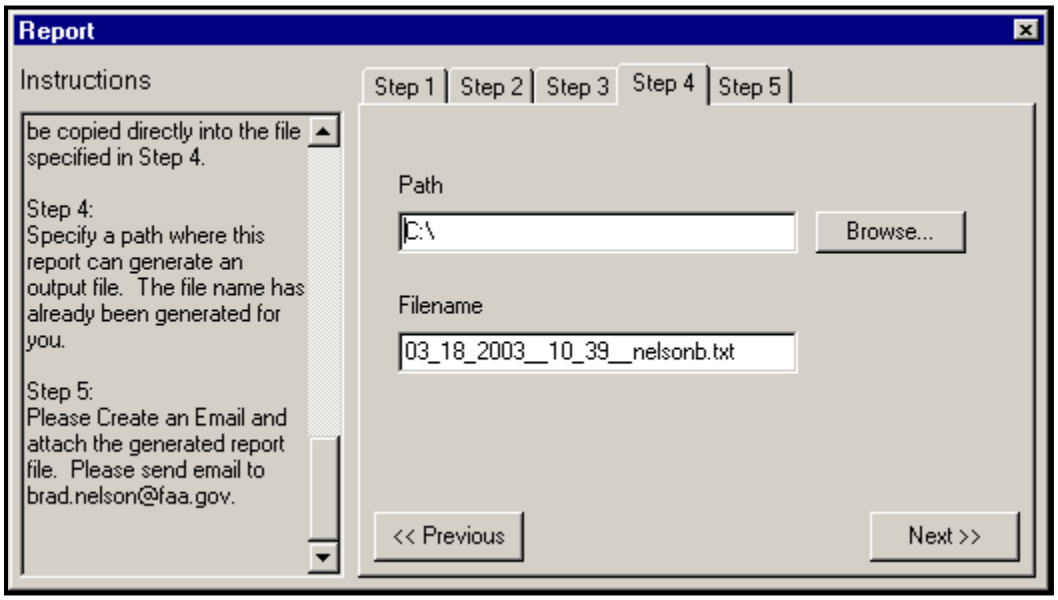


Figure 5-5: Problem Submission, Step 4

5.5 Step 5: E-mail Instructions

Please create an e-mail and attach the generated report file. Please send e-mail to:

RnavProSupport@AirTrafficSimulation.com

Please attach the file generated in Step 4 to the e-mail so that your report can be processed. Then, select **"Finish."**

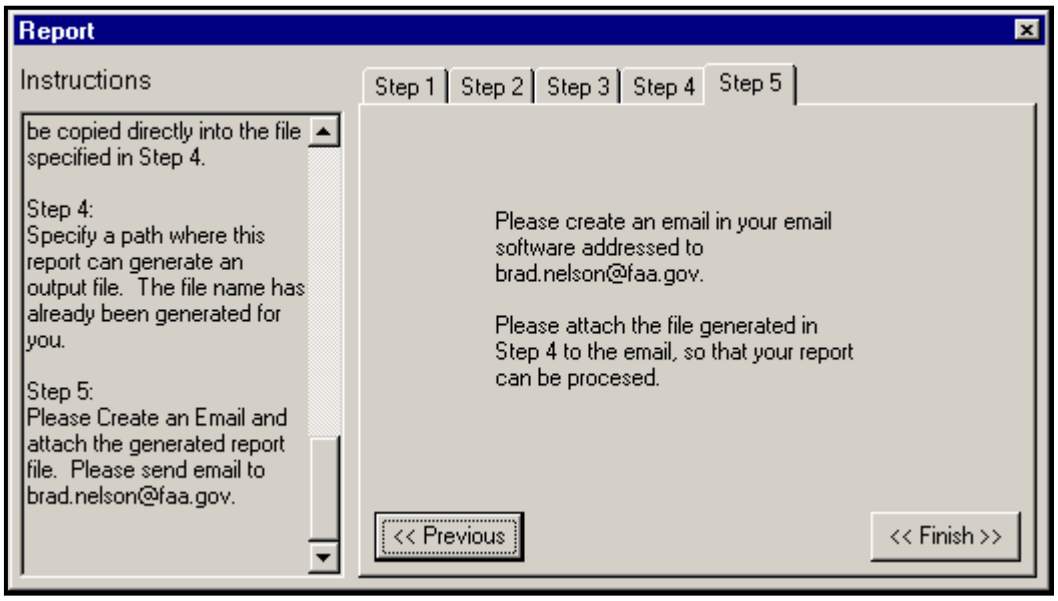


Figure 5-6: Problem Submission, Step 5